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DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL

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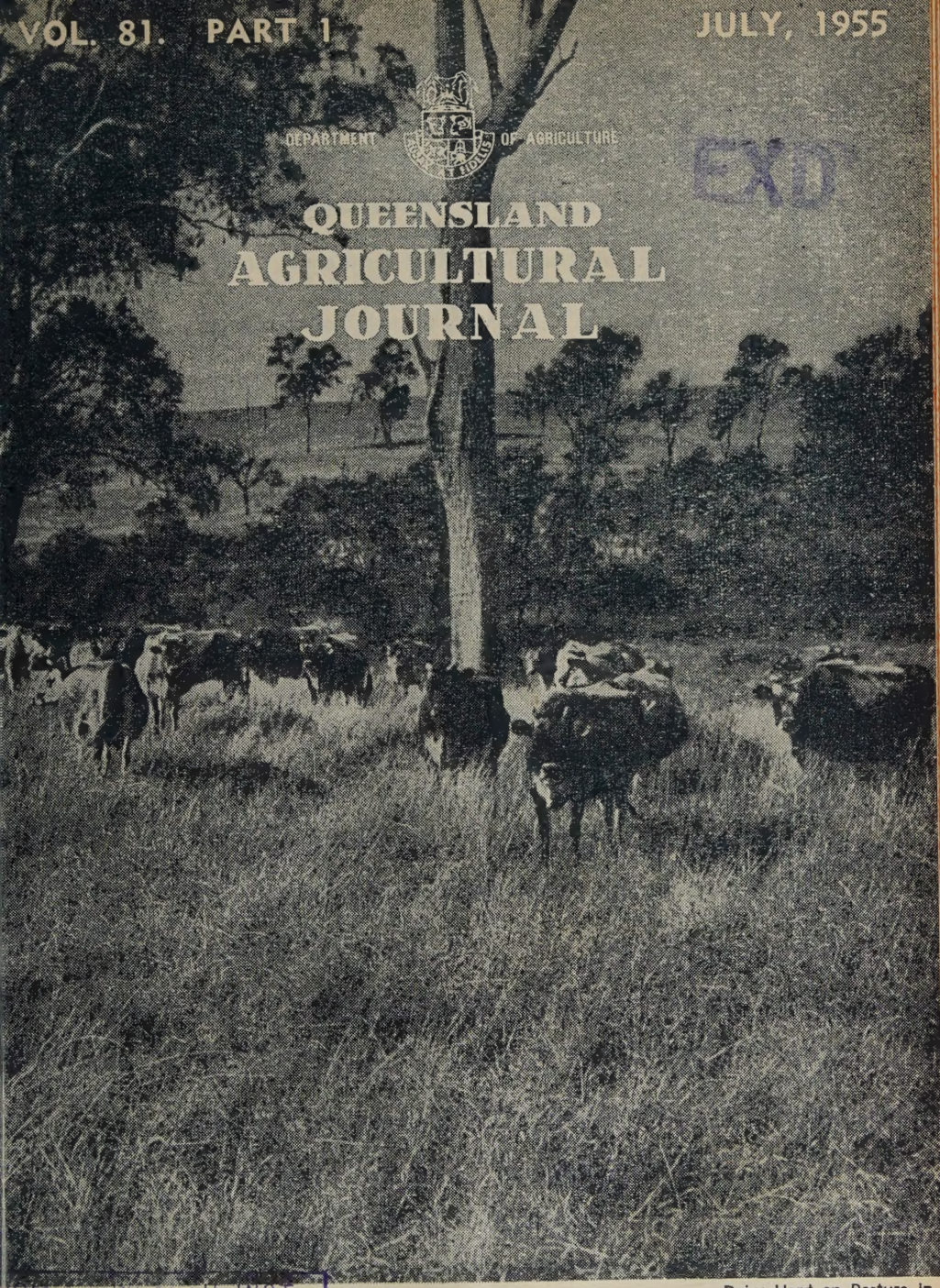

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(A list of extension services in southern Queensland will appear in our next issue.)

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Tuberculosis-Free Cattle Herds.

TESTED HERDS (As at 20th June, 1955).

The Tuberculosis-free Herd Scheme (which is distinct from the tuberculosis eradication scheme operating in commercial dairy herds) was initiated by the Department of Agriculture and Stock for the purpose of assisting owners of cattle studs to maintain their herds free from tuberculosis and so create a reservoir of tuberculosis-free cattle from which intending purchasers can draw their requirements. The studs listed here have fulfilled the conditions to the date shown above.

Breed.	Owner's Name and Address.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
	J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
	Sullivan Bros., "Valera" Stud, Pittsworth
	Reushle Bros., "Reubydale" Stud, Ravensbourne
	H. F. Marquardt, "Chelmer" Stud, Wondai
	A. C. and C. R. Marquardt, "Cedar Valley," Wondai
	A. H. Sokoll, "Sunny Crest" Stud, Wondai
	W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
	G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Groveley," Greenmount
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
	W. D. Davis, "Wamba" Stud, Chinchilla
	Queensland Agricultural High School and College, Lawes
	C. K. Roche, Freestone, Warwick
	Mrs K. Henry, Greenmount
	D. B. Green, Deloraine Stud, Durong, Proston
	E. Evans, Wootha, Maleny
	T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
	J. Crookey, "Arolla A.I.S. Stud" Fairview, Allora
	M. F. Power, "Barfield," Kapaldo
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	"St. Christopher's" and "Iona" Studs, Brookfield road, Brisbane
	E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
	C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
	G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
	T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
	A. C. Swendson, Coolabunia, Box 26, Kingaroy
	C. Scott, "Coralgrae," Din Din road, Nanango
	R. J. Wissemann, "Robnea," Headington Hill, Clifton
Jersey	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	F. J. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy Line
	R. J. Browne, Hill 60, Yangan
	P. J. L. Bygrave, "The Craigan Farm," Aspley
	R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
	P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
	E. A. Matthews, "Yarradale," Yarraman
	A. L. Semgreen, "Tecoma," Coolabunia
	L. E. Meier, "Ardath" Stud, Boonah
	A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
	W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
	Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meier and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
	D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
	J. W. Carpenter, Flagstone Creek, Helidon
	K. G. Johnson, "Windsor" Jersey Stud, Beaudesert
	W. S. Kirby, Tinana, Maryborough
	S. A. Crarib, "Trecarne Stud," Lockyer
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
Polled Hereford ..	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla
	D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick
	E. W. G. McCamley, Eulegie Park, Dululu
	Wilson and McDouall, Calliope Station, Calliope

Hybrid Maize is Pedigreed Maize—But We Must Choose the Right Hybrid for the Job.

By Dr. L. G. MILES, Assistant Director of Agriculture.

Most of us by now are familiar with the name of hybrid maize. We have been told, and many of us know from experience, that it is maize specially bred for high yields and good field qualities. We know that the seed costs more than ordinary maize, but is more than worth the extra cost.

Finally, it is most important for us to realise that we must buy fresh hybrid seed each year. The reason for this is that if we plant the seed from our commercial hybrid crop, the yield will immediately fall off, and no benefit will result.

WHAT TYPES OF HYBRID CAN WE BUY?

There are four sources of commercial hybrid maize seed in this country. The pioneer breeding centre in Australia is our own Queensland Agricultural College at Gatton. The hybrids which are made here are all given "Q" numbers, such as Q.23, Q.692 and Q.739.

The commercial seed production of these "Q" hybrids is carried out by registered farmers under the strict supervision of our Seed Certification Officers. All certified Queensland hybrid maize must be sold in sealed bags carrying the Government's certification label and seal (Plate 1).

Other groups of hybrids are marketed in New South Wales. One series is the Grafton Hybrids, which carry "GH" numbers and have also been given names such as Victory, Jubilee, Ensign and Standfast. These hybrids are made up very largely from Queensland parent lines, and are therefore very similar in general behaviour to many of our own "Q" hybrids.

A third series comprises the New England Hybrids which are bred at Glen Innes. These are given "NEH" numbers and also have names such as Dawn, Emblem and Sunrise. These hybrids have been bred for New England Tableland conditions, and are very different in many respects from the Queensland or the Grafton hybrids.

There is also a fourth group of hybrids, produced by the Don Shand Seed Company at Armidale, N.S.W. These are given "DS" numbers and are very similar to the "NEH" series. In fact, some of the "DS"

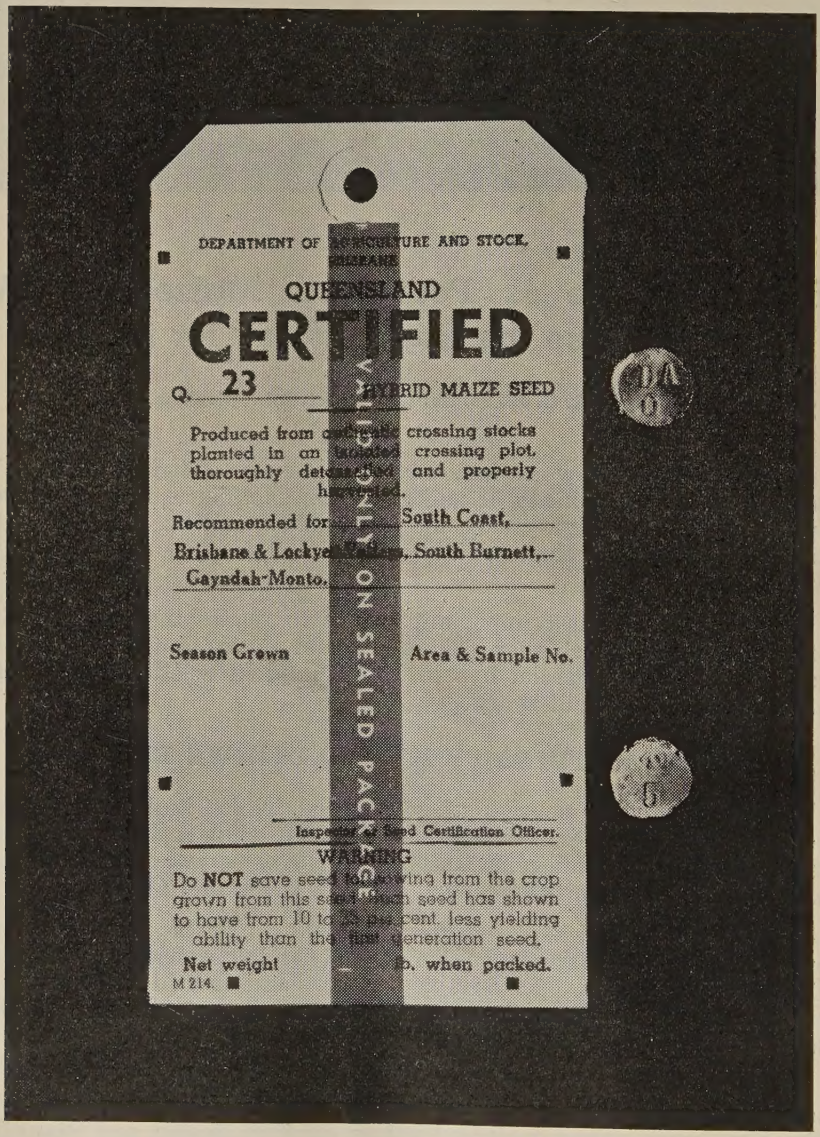

Plate 1.

The Label and Seal of Queensland Certified Hybrid Maize Seed. All "Q" hybrids are sealed and labelled in this manner. Such seed cannot legally be sold as Certified Seed if the label is removed or the seal broken.

numbers have exactly the same breeding as some of the "NEH" numbers. For example, DS.55 has the same make-up as NEH.17 or Sunrise.

HOW DO THESE HYBRIDS DIFFER?

As we have seen before, the "Q" hybrids have been bred in Queensland specially for Queensland conditions. These hybrids have all been thoroughly tested in field trials. They have only been named and

Plate 2.

How Hybrids Are Made in the Field. In this view of part of a crossing plot, the inside rows are of the "female parent," and the two outside rows of the "male parent." The female parent rows have had their tassels removed to make sure that they will be cross-pollinated by the male parent. The seed harvested from the female parent rows provides the commercial hybrid seed.

released after tests have shown that they can consistently outyield the best standard varieties in certain districts by more than 15%. They have also been chosen for good field characteristics such as sound root systems, strong stalks, and good husk covering. The majority of them are either of late or of midseason maturity.

The "GH" or Grafton Hybrids were selected for similar qualities in coastal New South Wales. They are also in the later maturing groups.

The "DS" and "NEH" series are distinctly earlier in maturity than any of the "Q" or "GH" hybrids. However, they have two very important weaknesses for coastal or sub-coastal conditions.

Firstly, they have very poor husk covering (see Plate 5). This may not be a disadvantage under the cold-winter conditions of inland tablelands in New South Wales, but it is a very bad feature in milder coastal climates where weevils are prevalent.

Secondly, the "DS" and "NEH" hybrids are often heavily attacked by leaf blights when grown in humid districts.

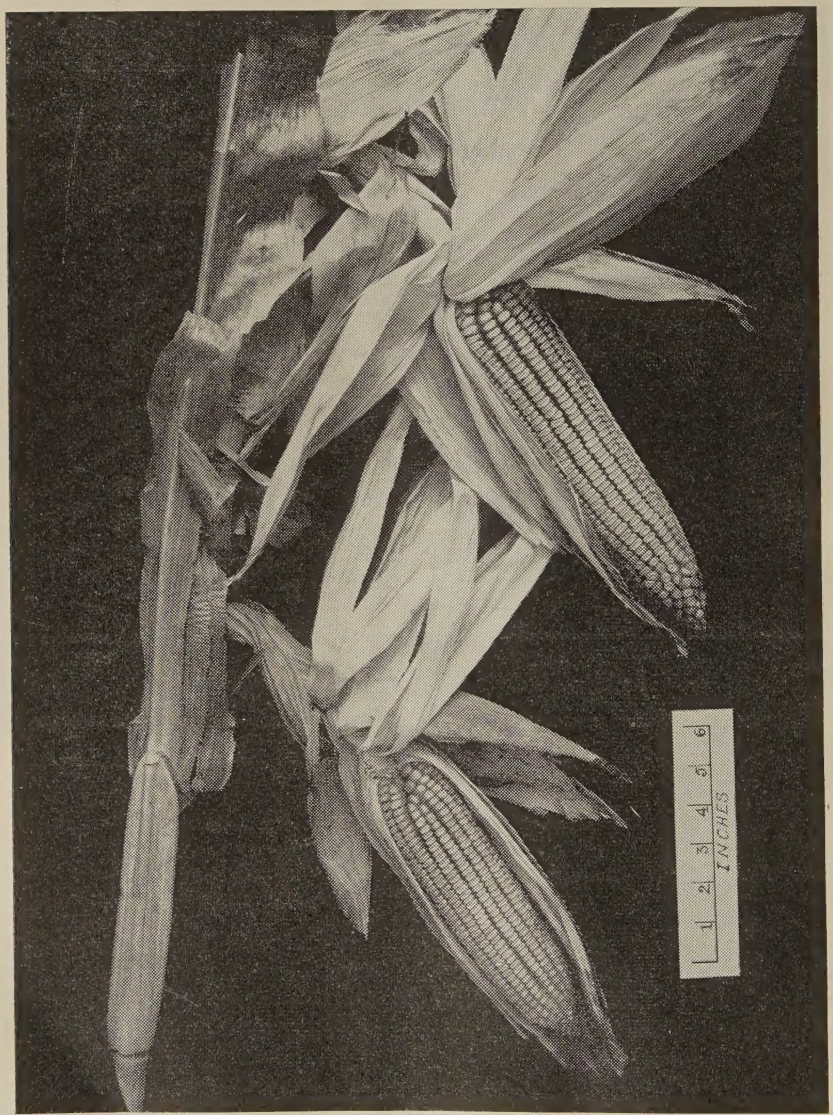

Plate 3.

Portion of a Stalk of Q.23 Maize, Showing Two Well-formed Cobs. This is one important way in which hybrids give higher yields than standard varieties.

DOES IT MATTER MUCH WHICH HYBRID I GROW?

It does matter a great deal which hybrid or hybrids we grow. A hybrid which might be unbeatable on the Darling Downs could be of little value at Mackay or Mareeba. Many farmers have said they have no time for hybrids because "they are no better than ordinary corn". If we ask such a man what hybrids he has tried, he probably can't

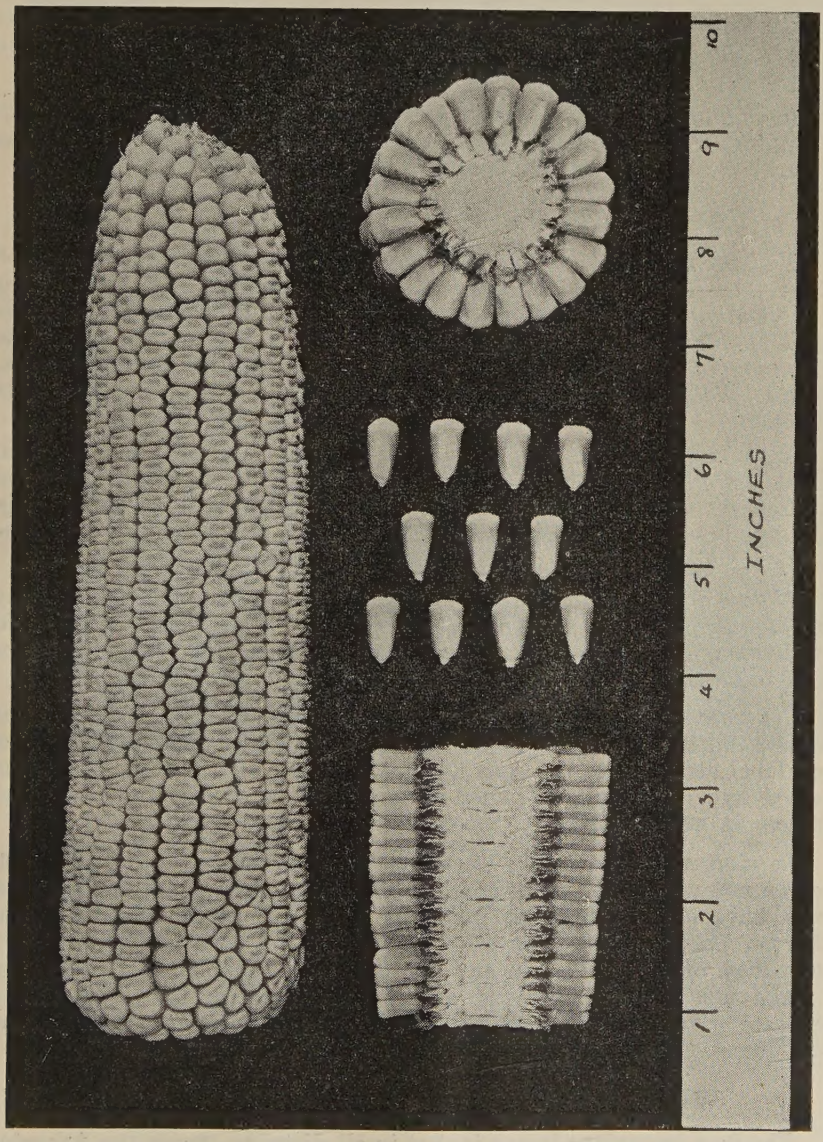

Plate 4.

Whole Cob, Sections of Cob, and Grain of Q.716. This adaptable mid-season hybrid has given good results in most districts from south to north Queensland.

tell us. Perhaps he didn't know that there were different kinds of hybrids, or perhaps he just took what the nearest storekeeper or produce merchant had to offer him.

All hybrids, if properly produced, are *pedigreed maize.* That is, they have a fixed breeding from four stable lines or "sires". Most of us appreciate the value of pedigree in our pigs or horses. But would we choose a blood stallion to do a draught horse's work? Or, if we wanted a gun dog, would we go to the nearest kennels and take the first animal that the salesman produced? We might well come home with a French poodle with a princely pedigree, but we wouldn't have a dog for the job in hand.

So with maize. Unless we are prepared to take some trouble to find out which hybrids are suited for our particular job, we might as well grow any "mongrel" material.

HOW DO I KNOW WHAT HYBRID TO GROW?

We have already been told that no "Q" hybrid is put on the market *until it has proved itself* in very thorough trials. Now the breeding centre is at Gatton. It is only natural therefore that the first field trials should have been carried out in maize districts radiating out from this centre. Such areas include the Beaudesert, Boonah, Darling Downs, Brisbane Valley, Lockyer Valley, Mary Valley, and South Burnett districts.

As a result of these tests, carried out over several years, certain hybrids have been *proved* to be better than the best of the old standard varieties. There is no doubt about these results. A 15% increase in yield has been used as the basis of these tests, and in many cases the recommended hybrid has given a much better average than this.

We may think of this as meaning that where our old variety (say Star Leaming) gave us 40 bushels per acre, the recommended hybrid would ensure an increase of *at least* 6 bushels per acre. Over 7 acres that's more than a ton of corn.

Where a "Q" hybrid can be firmly recommended for a particular district, the name of the district is clearly printed on every Certified Seed label attached to the seed of that hybrid. In the table of recommended hybrids on page 8, such hybrids are shown for the respective districts in **heavy type.**

In more recent years we have seen tests carried out by the Department in many districts much further afield than those mentioned before. Trials have been planted on farms as far north as the Burdekin, the Atherton Tableland, and Mareeba. It has not yet been possible to carry out enough of these trials in any one district to enable the Department to make *firm* recommendations, as has been done for the south-east of the State. However, the results have been most encouraging, and have given some very useful leads.

WHAT HAVE THESE TRIALS TAUGHT US?

The first important lesson is that in all districts except the Atherton Tableland "Q" hybrids have given much better yields than the best local varieties we could lay our hands on. This means that we may plant certain hybrids, such as Q.23 and Q.719, at Ayr or Mareeba with just as much confidence as we would in many southern districts.

The Department's general recommendations based on these results are shown in the table on page 8. Where the hybrids are printed in ordinary type, it means that only one or two trials have been carried out. If we get similar results consistently over three or four years, then these recommendations will have the same force as those shown in heavy type.

Plate 5.

Ears in Husk from Beaudesert District:—(1) Q. 692, (2) DS.99. The ears of Q.692 are well protected from weevil damage and from weather, while those of DS.99 are badly exposed.

Another important lesson we learn is that "DS" and "NEH" hybrids are of no use in any of our maize districts except the south-eastern corner of the Darling Downs. DS.28, DS.10 and NEH.24 did quite well in the Warwick-Killarney area, but even here Q.440 topped the yields. Everywhere else in the State the "DS" and "NEH" hybrids tried were lowest in yield. In addition, they often went down with disease, and the cobs were so poorly covered that the weevils spoiled the grain.

The other group of hybrids tested was the "GH" or Grafton Hybrid group. As we have already seen, these are related to our "Q" hybrids and, as expected, gave similar results. They proved good adaptable hybrids in a number of districts, and are therefore included in some of the general recommendations.

TABLE 1.

DISTRICT RECOMMENDATIONS FOR MAIZE HYBRIDS.

District.	Period of Maturity.			
	5 Months.		5½–6 Months.	
Coastal South of Brisbane River	Insufficient trials.		**Q. 23** **Q. 462**	**Q. 692**
Coastal North of Brisbane River to Gympie	**Q. 719** **Q. 724**	**Q. 716** Q. 790	Q. 23 Q. 462	**Q. 431** **Q. 526** **Q. 692**
Brisbane Valley	**Q. 716** **Q. 739**	**Q. 790**	**Q. 23** **Q. 431**	**Q. 462** **Q. 692**
Lockyer Valley	**Q. 440** **Q. 716**	**Q. 790** **Q. 739**	**Q. 23** **Q. 431**	**Q. 462** **Q. 692**
Fassifern Valley	**Q. 440**	**Q. 716** Q. 790	Insufficient trials.	
South Burnett	**Q. 440** **Q. 716** **Q. 719**	**Q. 724** **Q. 739**	**Q. 23** **Q. 431**	**Q. 526** **Q. 692**
Darling Downs North	**Q. 719** **Q. 724**	**Q. 739**	None recommended	
Darling Downs Central	**Q. 724** **Q. 739** **Q. 790**	Alpha* DS. 28*	None recommended	
Darling Downs South	**Q. 440** **Q. 716** **Q. 719** Q. 790	**Q. 724** **Q. 739** DS. 28* Sterling*	None recommended	
Gayndah-Monto	Q. 716 Q. 719	Q. 724 Q. 739	**Q. 23** Q. 431 Jubilee*	Q. 692 Victory*
Maryborough-Bundaberg	Q. 716 Q. 719	Q. 724 Q. 739	Q. 23 Q. 462	Q. 692 Jubilee*
Rockhampton	Q. 716	Q. 724	Q. 23	Q. 692
Callide-Dawson Valleys	Q. 440 Q. 716	Q. 724 Q. 790	Insufficient trials	
Mackay-Burdekin	Q. 716 Q. 719	Q. 724	Q. 23	Q. 692
Mareeba	Q. 440 Q. 724	Q. 739 Q. 790	Q. 23 Q. 692	Ensign* Victory*
Atherton Tableland	As a result of trials carried out to date, no hybrid can as yet be recommended			

Hybrids in heavy type are fully recommended; hybrids in ordinary type are provisionally recommended.

*Indicates New South Wales hybrid, not certified by the Queensland Seed Certification Committee.

The table of recommendations on page 8 has been drawn up as a result of the information gained from such trials. This table should act as our guide in deciding what hybrid or hybrids we shall plant next season.

WHAT OF THE ATHERTON TABLELAND?

Those of us who grow maize on the Atherton Tableland know that our seasons are quite different from those in any other part of the State. In many years the winters are dull and drizzly, harvesting is long delayed, and cob-rots are serious. Under these conditions we have not yet been able to find any hybrid which can consistently beat the local Atherton seed. This is especially true if the local seed has been carefuly selected.

In last year's trials one thing was certain. The "DS" and "NEH" hybrids were hopelessly out of their element. In some cases they broke down so badly as to be not worth harvesting. Some of the "Q" and "GH" hybrids showed some promise, but not one of them gave a clear indication of superiority over Atherton Dent.

We should not give up all hope of any improvement here. All available "Q" and "GH" hybrids will be thoroughly tested before this means of improvement is given away. At the moment, however, there is no known hybrid which can be confidently recommended for this district.

FLATS OR ROUNDS?

Many of us are used to planting only uniform flat seed—that is, the seed from the middles of the cobs. We therefore tend to look with disfavour on "round" grains from the butts or tips of the cobs. However, heredity is what really matters, and the heredity of the butt or tip grains is every bit as good as that of the "flats".

We need not be frightened that if we plant small round grains we will get a crop of cobs with only small round grains. The crop will be exactly the same, and the yield exactly the same, as if we used the large flat grains. This has been proved many times, and can be taken as an established fact.

There is no reason therefore why we should not use round grains if "flats" are not available. It may mean changing the planting plates, but any good maize grower should be prepared to do this, anyway.

The important point is that the seed should be *certified*. If we use Queensland Certified Seed, we have a guarantee that the breeding is right, and that should be our greatest concern.

WHAT ABOUT LAST YEAR'S SEED?

Seed which is over one year old is perfectly satisfactory so long as the germination has been re-checked during the current season. The germination standards for Queensland Certified hybrid maize seed are high. No hybrid was certified in 1954 unless it gave a germination percentage of 90 or over. Such seed, when stored under good conditions, will retain its standard for well over twelve months. The dust which is placed on all Queensland Certified hybrid maize seed ensures its protection from insect damage.

SPECIAL STUDY OF TOBACCO PROBLEMS.

The growth of the tobacco industry has been one of the outstanding agricultural developments in Queensland in recent years, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said recently. Its expansion into an industry worth £2,500,000 a year to the State is proceeding at the rate of approximately half a million pounds a year. With 4,000 acres under crop yielding about 4,000,000 lb. of leaf, the Queensland industry provides two-thirds of the total Australian tobacco production.

The Government is showing its great faith in the future of the industry by increasing the irrigation facilities available to growers. New weirs have been built and two major irrigation projects are being developed on the Barron and Burdekin Rivers.

With the development of irrigation and the expansion in the acreage under tobacco, special attention by technical officers is required. In the past, much important work has been carried out on soil problems, varieties, fertilizer requirements, and so on. However, it was felt that the appointment of a senior officer was necessary in order to co-ordinate such investigations and to build up a more comprehensive advisory service for farmers.

For this reason Mr. F. Chippendale has been appointed Senior Agronomist in charge of agronomic investigations in tobacco. Formerly Senior Soils Technologist in the Department, Mr. Chippendale has for some years been closely associated with quality investigations in all of the main tobacco-growing districts of the State.

He is thus well-equipped to undertake the responsibility of planning and supervising the tobacco work on the experiment stations being developed by the Department in tobacco growing districts.

These stations are at Parada (near Mareeba), Millaroo (Lower Burdekin), and Inglewood. A programme of investigations has now been commenced at Inglewood, and progress is being made in the erection of buildings and in clearing the land at Parada and Millaroo.

BREEDING PLANTS FOR QUEENSLAND CONDITIONS.

Queensland plant breeders have recently achieved two notable successes in developing new high-yielding varieties of winter cereals, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said recently.

The most striking accomplishment of plant breeders in the Department has been the excellent field performance of the Queensland-bred wheat, Spica. Last season, the third since its release for general distribution, it attained the position of premier variety in the State. During the 1954 season, 120,550 acres (equivalent to 17½ per cent. of the State's wheat acreage) were sown down to Spica.

A report by Mr. W. J. S. Sloan, Director of Agriculture, indicates that, at harvest time last season, some difficulty was experienced in threshing the grain from Spica. The report explains that it is this very toughness of the heads which confers a real benefit during a wet season. Because the heads of Spica do not shatter, the variety is able to resist damage from adverse weather. Spica is, of course, highly resistant to stem rust.

Unfavourable weather at the 1954 harvest caused some loss in appearance and bushel weight of the season's crop. However, it is pleasing to note that the prevalence of gluten-rich wheats, among which Spica excelled, enabled bread-making quality to be maintained.

All stock-owners grazing oats are well aware of the hazards of rust damage in the crop. The recently-released Queensland-bred Bovah oat, which is resistant to crown rust, is destined to become an important fodder crop in all agricultural districts where grazing oats can be grown.

Drawbar Hitch for Ganged Mowers and Side-Delivery Rake.

By C. G. WRAGGE, Adviser, Agricultural Engineering.

Preliminary investigations into the potentialities of bush hay as a fodder reserve were made by the Department of Agriculture and Stock in 1952. As a result of analyses of the bush hay samples obtained, it was reasonable to expect that the nutritive value could be appreciably improved if the time lag between mowing, raking and baling could be reduced.

This obviously called for an increase in cutting width, and the combining of mowing and raking into one operation.

Various methods of hitching ganged mowers and a side-delivery rake have been described in agricultural periodicals. But, in every case reported, the ganged mowers have been of the trailed type. In this particular case, a 3-point linkage 6 ft. Ferguson power mower with a cutter-bar safety release had to be ganged to a 4 ft. 6 in. wheel-driven McCormick International GL-9 mower and a John Deere No. 594-LW side-delivery rake.

The drawbar and hitch illustrated were specially designed for the ganging of the particular makes mentioned above. In addition, it had to comply with particular requirements of the mobile field unit operated by the Department. Thus the unit or kit-type design of the drawbar, which allows for easy assembling, dismantling, loading and unloading, need not necessarily apply in more normal circumstances.

Similarly, the overall width of the drawbar, which in this case was 16 ft., would depend on the dimensions of the particular makes of mower and side-delivery rake employed. The length of the hitchpole would also depend on whether a cutter-bar safety release was incorporated in the tractor-mounted power mower.

The two 8 ft. sections of the drawbar were constructed of 3 in. × 3 in. hardwood and 3 in. × 2½ in. × ¼ in. angle iron. They were coupled together by 3 in. × ½ in. flat steel fishplates and 5 in. × ½ in. bolts with the braced timber hitchpole mounted in the centre. This gave the weight and rigidity required for operating under

Plate 1.

Rear View of the Tractor with Mowers and Side-delivery Rake Operating in Open Grassland.

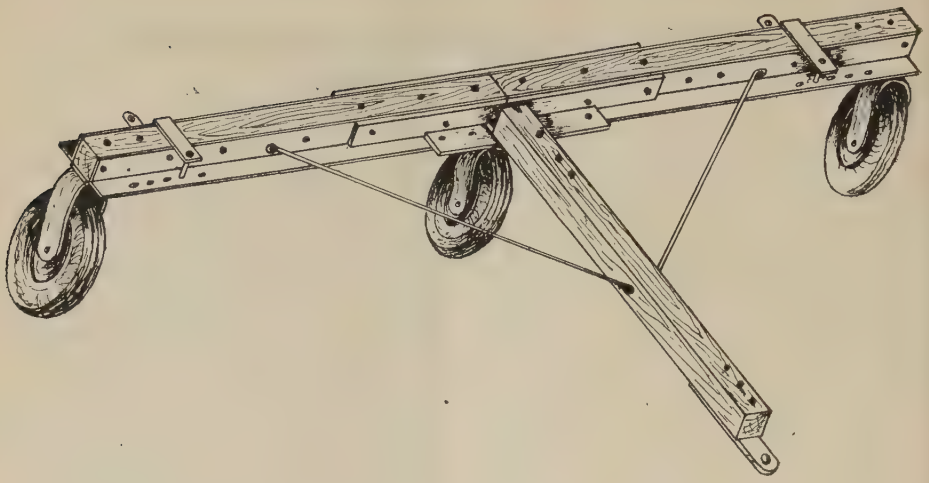

Plate 2.

Perspective View of the Drawbar Described in This Article.

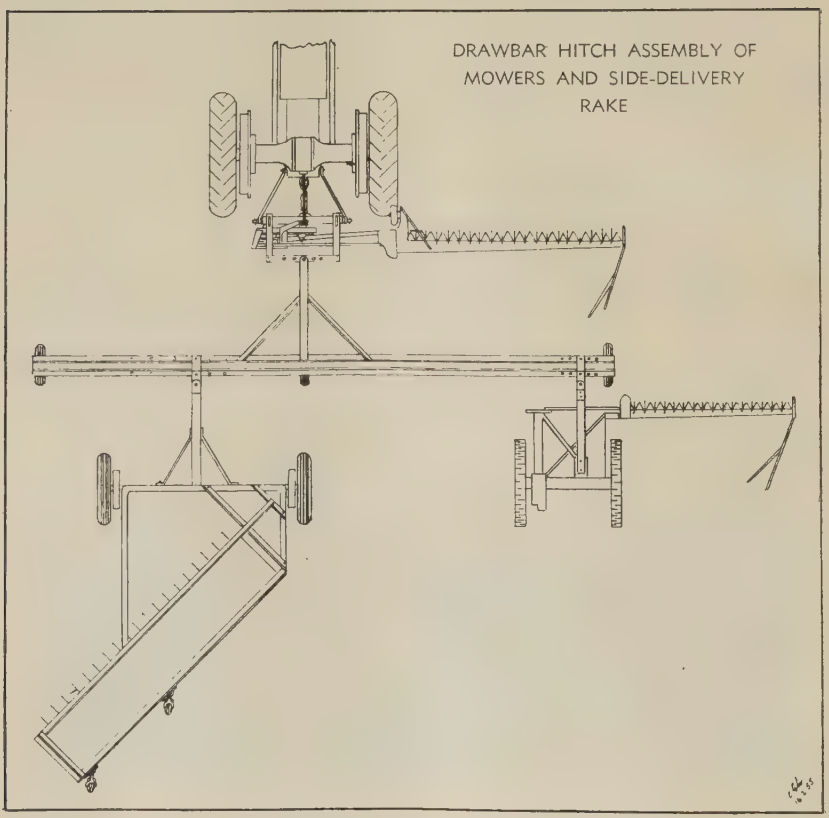

Plate 3.

Plan Showing the Hitch Assembly for Drawbar, Mowers, and Side-delivery Rake.

rough conditions. The drawbar was mounted on 16 in. × 4 in. pneumatic-tyred industrial wheels, which helped to reduce the draught of the whole unit assembly.

Owing to the presence of a tractor-mounted 3-point linkage power mower, it was not possible to hitch directly to the tractor drawbar. A U-shaped extension drawbar constructed of 3 in. × ½ in. flat steel was clamped by means of U-bolts to the drawbar mounting of the Ferguson mower connected to the two lower links of the tractor 3-point linkage.

The Ferguson TEA.20 tractor comfortably handled the whole assembly in second gear in spite of the rough country worked. Using this tractor and assembly during 1954, an average of approximately 20 acres per 8-hour day was mowed and raked.

Due to the high temperatures prevailing in the Central Highlands during the months of February and March, it was possible to commence baling operations approximately three to four hours after mowing and raking. This lead of a few hours enabled the ganged assembly to keep the New Holland "80" pick-up baler fully occupied for the remainder of the day.

Copies of constructional plans of the drawbar are available, and enquiries should be addressed to the Under Secretary, Department of Agriculture and Stock, William Street, Brisbane.

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MARK YOUR SAMPLE

Sample of ..... seed
Drawn from ..... bags
Representing a total of .....
Purchased from .....
Name and Address of Sender
Date.....

SIZE OF SAMPLE

Barley	8 oz.	Oats	8 oz.
Beans	8 oz.	Peas	8 oz.
Grasses	2 oz.	Sorghum	4 oz
Lucerne	4 oz.	Sudan	4 oz.
Millets	4 oz.	Wheat	8 oz.

Vegetable Seeds - ½ oz.

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Brucellosis-Tested Swine Herds (As at June 20, 1955.)

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
G. Handley, "Handleigh" Stud, Murphy's Creek
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, "Kennington" Stud, Underwood road, Eight Mile Plains
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, "Burdell," Goovigen
N. F. Cooper, Maidenwell
R. H. Collier, Tallegalla, *via* Rosewood
E. J. Clarke, "Kaloon" Stud, Templin
M. G. and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
Dr. B. J. Butcher and A. J. Parnwell, "Hartley Grange" Stud, 684 Logan Road, Greenslopes
C. E. Edwards, "Spring Valley" Stud, Kingaroy
G. McLennan, "Murcott" Stud, Willowvale
H. M. Wyatte, "Deepwater" Stud, Rocky Creek, Yarraman
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
R. J. Webber, "Webberberry" Stud, 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
The Marsden Home for Boys, Kallangur
M. F. Callaghan, Lower Mount Walker, via Rosewood
J. B. Lotz, M.S. 794, Kalbar
G. J. Hutton, Woodford
E. R. Kimber, Coalstoun Lakes
K. B. Jones, "Cefn" Stud, Pilton
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
L. Pick, Mulgeldie
J. W. Bukowski, "Secreto" Stud, Oxley

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
K. B. Jones, "Cefn" Stud, Pilton
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
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R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
S. and S. Ouglitchinin, "Pinefields," Old Gympie road, Kallangur
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
Kruger and Sons, "Greyhurst," Goombungee
V. V. Radel, Coalstoun Lakes

Tamworth.

S. Kanowski, "Miecho" Stud, Pinelands
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Salvation Army Home for Boys, "Canaan" Stud, Riverview
A. J. Surman, "Namrus" Stud, Noble road, Goodna
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
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T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
L. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
H.M. State Farm, Numinbah
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P. V. Campbell, "Lawn Hill," Lamington

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
J. Gleeson, "Iona Vale" Stud, Kuraby
C. R. Smith, "Belton Park" Stud, Nara
H. H. Sellars, "Tabooba" Stud, Beaudesert
H. Thomas, "Eurara" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trout road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
F. K. Wright, Narangba, N. C. Line
R. A. Collings, "Rutholme" Stud, Waterford
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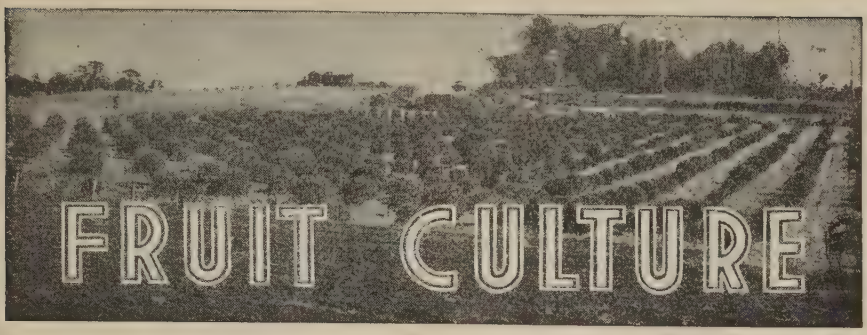
A. J. Hicks, M.S. 98, Darlington, *via* Beaudesert
Kruger and Sons, "Greyhurst," Goombungee

British Large Black.

H. W. Naumann, "Parkdale" Stud, Kalbar



Resistant Stocks for Grapes at Stanthorpe.

By D. TAYLOR and T. J. BOWEN, Horticulture Branch.

In the 1860's a small aphid appeared in many French vineyards and seriously threatened the grape industry in that and other European countries where the crop was grown on a commercial scale. This insect, now known as Phylloxera, had been introduced on vines imported from America because of their resistance to powdery mildew and other diseases.

As early as 1869, it was noted that certain American vines continued to flourish amongst European varieties which were infested with Phylloxera and lacked both vigour and productive capacity. Further investigation soon established that the aphid was native to eastern North America and that many of the grapes which were indigenous to that area possessed some resistance to the pest. The degree of resistance varied from species to species and none could be classed as wholly immune. Nevertheless, the important point was their ability to grow normally in Phylloxera-infested areas. This contrast in the ability of American and European vines to tolerate infestation is probably due to differences in the structure of the plants; in the former the bark is well developed, whereas in European vines it is relatively thin.

American Vines as Stocks.

Once the resistance of American vines to Phylloxera was recognised, they were imported to Europe on a sizeable scale primarily to replace the declining European varieties. However, in none of them was the fruit comparable with that of the traditionally accepted varieties which were threatened with extinction. Fortunately, it was soon discovered that when the susceptible European varieties were grafted onto some of the American types, the vines grew and cropped reasonably well. This discovery made possible the reconstruction of vineyards devastated by the pest and resulted in one of the world's greatest horticultural achievements.

The behaviour of any variety of grape when grafted onto a resistant stock is seldom the same as that of the vine on its own roots. Vigour may be increased or decreased, time of fruit maturity may be altered, and the palatability of the fruit may be modified. In addition, stocks show different soil preferences and a type which flourishes in one area may be quite unsuitable for another. Hence, although the pattern of future production was soon established in Europe, many years elapsed before possible stock-scion combinations for particular areas were thoroughly tested and the best selected for commercial production.

The repercussions of the Phylloxera catastrophe in the 19th century were so profound that even in areas where the insect has not been recorded it is

customary in all the major grape-growing districts to keep resistant stock material on hand and to acquire local information on stock-scion compatabilities. If an outbreak did occur, vineyard reconstruction could then begin immediately.

Several American vines are of commercial interest because of their resistance to Phylloxera, the more important being *Vitis rupestris, Vitis riparia* and hybrids between these species. In addition, some hybrids between American and European vines are of value.

Phylloxera Appears in Australia.

Phylloxera made its appearance in Victoria in 1875, having been introduced on vines imported from overseas, and gradually spread to New South Wales. It was first recorded in Queensland in 1910 at Enoggera, a suburb of Brisbane. In spite of action taken at that time to cope with the outbreak and the comparative lack of importance of grapes in southern coastal Queensland, it reappeared in 1932 in another suburb, Myrtletown. The City of Brisbane was then proclaimed under the Diseases in Plants Acts as a quarantine area from which "the removal of all plants or portions of plants of all and every species of *Vitis* except the fruit thereof" is prohibited.

Phylloxera has not been recorded elsewhere in the State and the main producing areas—Stanthorpe, Roma and the Brisbane Valley—have remained free of the pest. Nevertheless, a large proportion of the vines planted at Stanthorpe since 1910 have been worked onto resistant stocks. The best known of these are R. du Lot, 3309 and A.R.G.1.

Resistant Stocks under Trial.

The American vines are more exacting in their soil requirements than the European types, and though hybridization has extended the range of stocks on which European vines can be grafted, the selection of a suitable stock for any particular variety in any given area demands careful attention.

The several resistant stocks all have certain characteristic effects on the scion variety. Rupestris tends to promote vegetative growth of the scion and sometimes reduces the size of the crop; it is therefore most suitable for varieties which habitually bear very heavy crops. Riparia induces early ripening in the scion and grafted vines on this stock are usually not long-lived. Berlandieri and its hybrids have most of the good features of Riparia without its defects; they are consequently, best adapted for use with medium or shy-bearing European varieties.

At Stanthorpe, where Phylloxera-resistance of the stock is of no consequence at the present time owing to the absence of the pest, the main horticulural benefit derived from resistant stocks is the vigour imparted to the scion variety. This is particularly important in Waltham Cross, a mid-season variety, and in Purple Cornichon, a late season variety, both of which are frequently shy-bearing in habit when established on their own roots in the relatively infertile soils of the Granite Belt. A substantial portion of the acreage under these two varieties is therefore grafted onto resistant stocks.

The early maturing Muscat Hamburg grown on its own roots usually crops well in the Granite Belt but annual cane growth is relatively weak. When grafted on to Phylloxera-resistant stocks, vigour is increased and vegetative growth is improved. This is not always an advantage, for under certain conditions the flavour and colour of the fruit are altered and berry-cracking after rain becomes more pronounced. A suitable resistant stock for this variety in the Granite Belt has still to be located; it may be found in one of the strains with Riparia characteristics.

Resistant Stocks under Trial.

The performance of the three main commercial varieties at Stanthorpe—Muscat Hamburg, Waltham Cross and

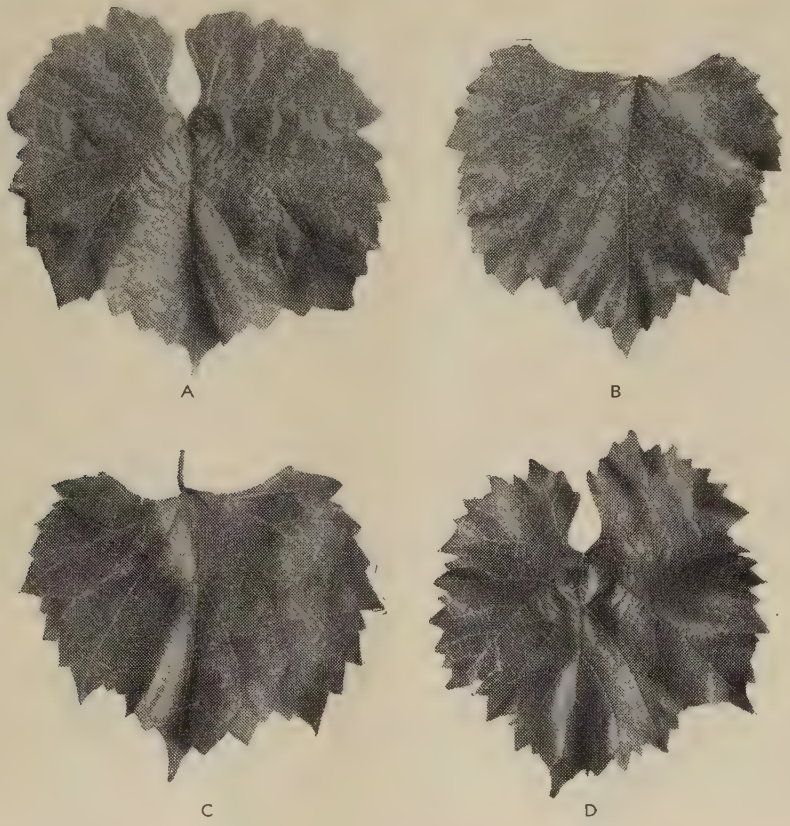


Plate 1.

Leaves of Resistant Stocks: (A) 18804; (B) Richter 99; (C) R du Lot; (D) 1202.

Purple Cornichon—on resistant stocks is being investigated in an experimental vineyard at Sevenlea. The vines are only five years old and many are not yet in full bearing. It is too early therefore to assess the compatabilities of the several stock-scion combinations with any accuracy. Obvious differences in vigour in the resistant vines themselves are apparent, and for working purposes they have been graded into three classes as follows:—

Class 1 (high vigour)—18804, Richter 99, R. du Lot.

Class 2 (medium vigour)—1202, A.R.G1., 420 A.

Class 3 (low vigour)—3309, 3306.

The typical characteristics of these eight resistant stocks (Plates 1 and 2) are as follows:—

18804 (*Montecola* x *Riparia*)—Extremely vigorous, semi-erect bush; canes moderately long with few laterals, chestnut in colour; leaf fairly large, dull-green and glabrous with a deep U-shaped sinus and long petiole; sterile.

Richter 99 (*Rupestris* x *Berlandieri*)—Extremely vigorous, semi-erect bush; canes moderately long with numerous laterals, light brown colour; leaf small, somewhat cupped, light-green, with flat V-shaped sinus and short petiole; sterile.

R. du Lot (*Rupestris du Lot*)—Extremely vigorous, semi-erect bush; canes long with numerous laterals, light brown colour; leaf moderate in size, dull mid-green, with fully open sinus and moderately long petiole; sterile.

Plate 2.

Leaves of Resistant Stocks: (A) A.R.G. 1; (B) 420 A; (C) 3309; (D) 3306.

1202 (*Mouvedre* x *Rupestris*)—Vigorous, semi-erect bush; canes moderately long with few laterals, light brown colour; leaf medium in size, glabrous, light-green with a deep U-shaped sinus and medium petiole; bears fruit.

A.R.G. 1. (*Aramon* x *Rupestris Ganzin*)—Vigorous, erect bush; canes moderately long with numerous laterals, light-brown colour; leaf small to medium, glabrous, dull-green with a deep, but open U-shaped sinus and medium petiole; sterile.

420*A* (*Berlandieri* x *Riparia*)—Vigorous, semi-erect bush; canes long and thin with few laterals, light brown colour; leaf medium, glabrous, dull metallic-green with a deep but wide U-shaped sinus and short to medium petiole; sterile.

3309 (*Riparia* x *Rupestris*)—Moderately vigorous, rambling bush; canes long and thin, slightly fuzzy, reddish-brown colour; leaf small, metallic-green with elongate tip, deep V-shaped sinus and short petiole; sterile.

3306 (*Riparia* x *Rupestris*)—Moderately vigorous, rambling bush; canes long, thin, slightly fuzzy, brownish-red in colour; leaf small, light glossy-green with elongate tip, deep open V-shaped sinus and short petiole; sterile.

The Litchi.

By S. E. STEPHENS, Horticulturist.

Southern China is generally regarded as the home of the litchi, and in that country the tree is fairly extensively cultivated, particularly in the Canton region. It was first introduced to Queensland in 1854, but since then several of the best Chinese varieties have been established in the Far North.

Under suitable climatic and soil conditions, the tree is densely foliaged and grows to a height of about 40 feet. It is distinctly ornamental and therefore useful around the home or as a shade tree on the farm. The glossy, bright-green leaves are compound, with 2-4 pairs of leaflets. Flowers are very small and are borne in many-flowered terminal panicles during the early spring months.

Individual fruits occur in clusters and each is flattish-oval in shape, up to 1½ inches long and with a thin, warty rind that ripens to a bright-red colour and later turns brown as the fruit becomes over-ripe. The fleshy edible portion of the fruit is translucent and jelly-like, with a firm texture and sub-acid flavour. In Queensland, the fruit ripens between November and January.

SOIL AND CLIMATE.

Fertile, alluvial loams produce vigorous trees which bear satisfactory crops, but good trees also occur on many other soil types in North Queensland. Whatever the soil type, ample moisture is essential; lack of soil moisture during the dry months of the year is frequently responsible for poor fruiting in the litchi. A humid atmosphere also is desirable.

The tree thrives in the tropics but may also be grown in the sub-tropical climate of southern Queensland so long as the plants are not actually subjected to frost.

CULTURE.

Litchi trees may be raised from seed or by aerial layering or marcotting. Propagation from seed is not desirable in commercial orchards as the seedlings do not reach maturity until they are about 15 years old and even then may be irregular in their cropping habits. Further, seedling trees do not necessarily reproduce the habits and characteristics of the parent.

Marcotting or aerial layering, while a somewhat tedious method of propagation, gives a plant with the fruiting characteristics of the parent tree and capable of producing commercial crops in about five years. Trees raised by this method tend to have a weak root system when they are young and consequently a newly-established orchard requires a great deal of attention. However, they eventually grow into vigorous, strongly-rooted plants.

Propagation by budding or grafting has not proved successful with the litchi. This fact, coupled with the difficulties of marcotting, is probably responsible for the comparatively few trees growing in Queensland at the present time.

The litchi has an extensive but somewhat shallow root system. A mulch of decaying vegetation is, therefore, desirable to conserve moisture and prevent extremes of temperature in the surface soil.

Fertilizer practices have not been established for the commercial crop. Overseas, organic manures are widely used but this practice is probably dictated by the availability and cost of fertilizing materials rather than by experimental data. In Queensland, satisfactory results could be expected from a complete mixture with an 8-10-10 or similar formula applied in annual dressings of 5-25 lb. per tree according to age and size.

PRUNING.

In the young tree, pruning should be directed to the formation of a shapely head in which the branches are evenly spaced to allow all parts of the tree a reasonable share of light and air. If the early pruning has been properly done, the removal of large branches later on should not be necessary and the annual pruning will then be restricted to shortening the fruit-bearing wood. It is customary to carry out this pruning when the crop is harvested by cutting the fruit clusters with approximately half to two-thirds of the annual wood growth attached. This practice induces early regrowth of the fruiting wood which will carry the following season's crop.

VARIETIES AND YIELD.

A considerable number of varieties is recognised in both China and India and several of the best have been introduced to Queensland. *Sum Yit Hoong* is the earliest variety in China but tends to have large seeds and a thin flesh; it has not yet been introduced to this country. *Noh Mai Chee* has the reputation of being the best Chinese fruit, but under Queensland conditions is extremely shy-bearing. *Kwai Mee* and *Wai Chee* are undoubtedly the best varieties in this State, while *Haak Ip* also has given satisfactory results.

Cropping varies considerably according to the age and condition of the tree. Average yields are probably about 100-200 lb. per mature tree.

The prospects for the litchi in Queensland should be good, for, apart from the difficulty of securing plants in the first instance, the tree is almost as easy to grow as the orange. Current production is, however, low and very few people other than those resident in North Queensland are familiar with the fruit. Considerable expansion will, therefore, be necessary, before the litchi can attain the status of a commercial crop. During this period of expansion, the fruit will have to be presented in an attractive pack at reasonable prices if its undoubted merits are to be fully appreciated by the consumer.

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The Supplementary Feeding of Sheep in Queensland.

Part 3. How Does the Amount of Feed Influence Wool Growth in Young Sheep?

By G. R. MOULE, Director of Sheep Husbandry.

The sheep is in a happy position. It eats to live, but it also lives to eat! The important question from your point of view as a woolgrower can be stated simply: How much does a sheep have to eat to live well and produce at its maximum? This is not a very difficult question to answer, because people all over the world have made careful observations to find the answer.

The next question is a little more difficult, but it is all-important in making any decision about supplementary feeding. What will be the net cash return from feeding a supplement to your sheep? This will depend upon the price of feed and the amount that has to be fed to increase the wool weights or lamb-marking percentages. After all, the aim of supplementary feeding is to increase production, although wise feeding will avert drought losses as well. But first of all let us consider the effects of high and low levels of feeding upon sheep.

Everyone knows that animals that are well fed grow better and produce more than those that are poorly fed. However, as you need to put an £. s. d. sign on supplementary feeding, it is necessary to know the cost of increasing growth rate or wool production and the net cash return you will receive from feeding a supplement to do so.

The effects of different levels of feeding on sheep have been studied, mainly by officers of C.S.I.R.O., whose work has been drawn upon freely in compiling these articles. The results they have obtained have thrown considerable light on the lasting effects correct feeding has upon the productivity of sheep.

FEEDING AND WOOL GROWTH.

Let us consider the effects of different levels of feeding on the production of wool. The amount of clean wool produced by a sheep will depend upon:—

(1) The area of its woolgrowing skin surface.

(2) The number of woolgrowing follicles to each square inch of woolgrowing skin.

(3) The average thickness of each wool fibre.

(4) The average length of each fibre, which is determined by the rate at which the wool fibres grow.

The extent to which each of those characters develops will depend upon many things. Firstly, there are the inherent characters of the animals. Some breeds of sheep have small skins, some have large. Sheep of some breeds have a large number of follicles to each square inch of skin; some have few. Some breeds grow fine wool, some grow coarse wool; some breeds grow long wool, some grow short wool. The extent to which each of these characters will develop will be governed by where the sheep lives. Some sheep enjoy bush conditions; others have to forage over bare hills in order to gather enough food to live. These wide differences in the quantity of food the sheep can gather influence the amount of wool they grow.

The way sheep are fed can only modify their fleece within the limits set by inheritance. For instance, if a sheep inherits qualities that make it grow a 64's wool no amount of feeding will make it grow a 58's wool. However, starve that sheep and you could fine its fleece down to a 70's, 80's or even 100's count.

Variations in the amount of food can have spectacular effects on wool growth. Their influence starts early in life when the sheep are growing. This influence may persist through the whole of the sheep's life.

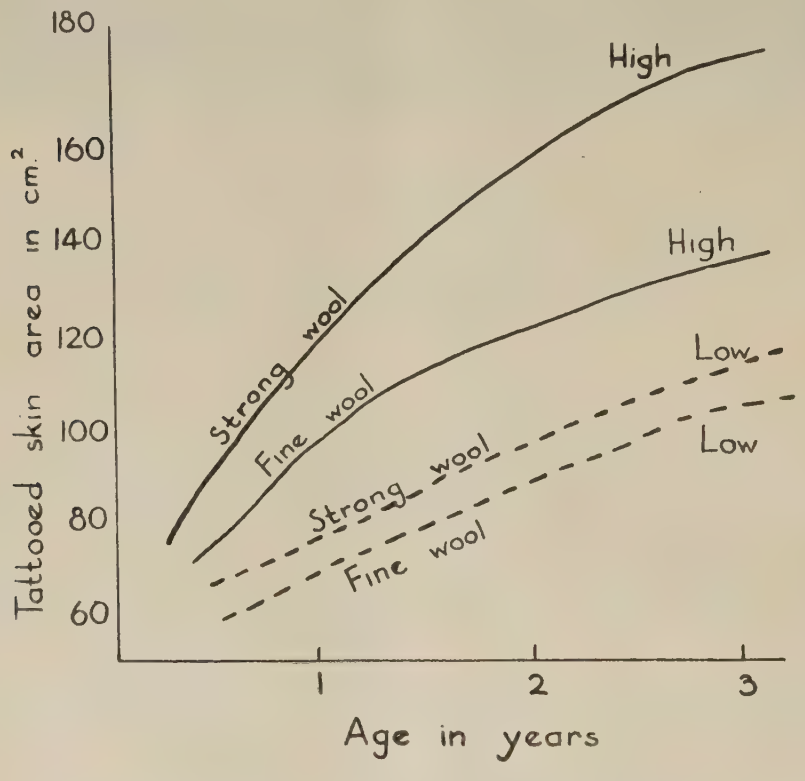


Fig. 1.

Effect of Plane of Nutrition During Growth on Skin Expansion of Merinos.

Suppose we were to take two groups of young Merinos bred in the same strong-woolled flock and another two bred in a fine-woolled flock. Let us give one group from each flock ample good quality food, and the other group restricted quantities of the same foodstuffs. Suppose we tattooed a patch of skin on the side of each sheep and measured it every three months or so. We would be able to get some idea of the rate at which its area increased. The effect this treatment will have on the expansion of the skin on these young growing sheep is shown in Figure 1. This shows that the rate of expansion of the skin is hastened by liberal feeding, but retarded by restricted feeding. This applies to both the strong-woolled and the fine-woolled sheep, but within certain limits the level of feeding was more important that the sheep's inheritance. No amount of feeding could increase the skin area of the fine-woolled sheep beyond a certain level. On the other hand, poor feeding of the strong-woolled sheep reduces the rate at which their skin expanded to about that of poorly-fed fine-woolled sheep.

The sheep's skin may grow at about the same rate as its body. This is commonly the case in Corriedale and

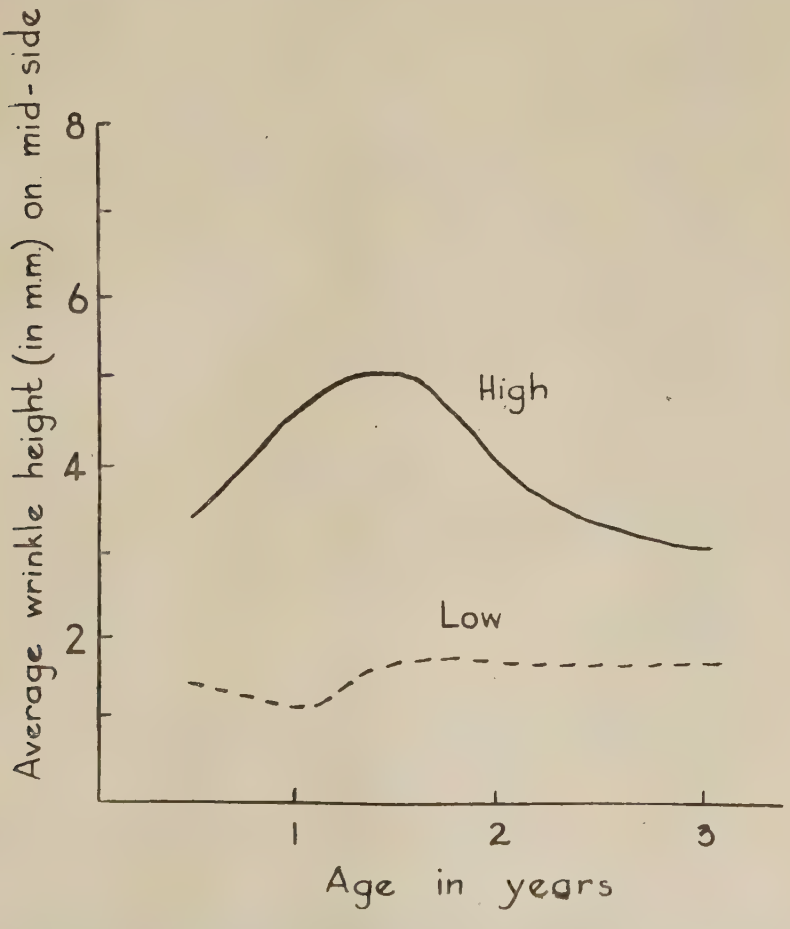


Fig. 2.

Effect of Plane of Nutrition During Growth on Wrinkle Height in Fine-woolled Merinos.

British breeds. If the skin grows more quickly than the body, as it frequently does in well-fed Merinos, it develops wrinkles. In fact, the number and size of the skin wrinkles in Merinos depend largely upon the way they were fed. This is shown in Figures 2 and 3, which depict the effect of different levels of feeding upon the height and number of skin wrinkles grown by fine-woolled sheep.

EFFECT OF THE SKIN'S GROWTH ON FOLLICLE NUMBER.

The follicles are laid down in the skin during the last few weeks before the lamb is born. However, the skin grows quickly as the lamb gains weight after it is born. As the skin grows more quickly than follicles come into production, the number of follicles in each square inch of skin actually falls.

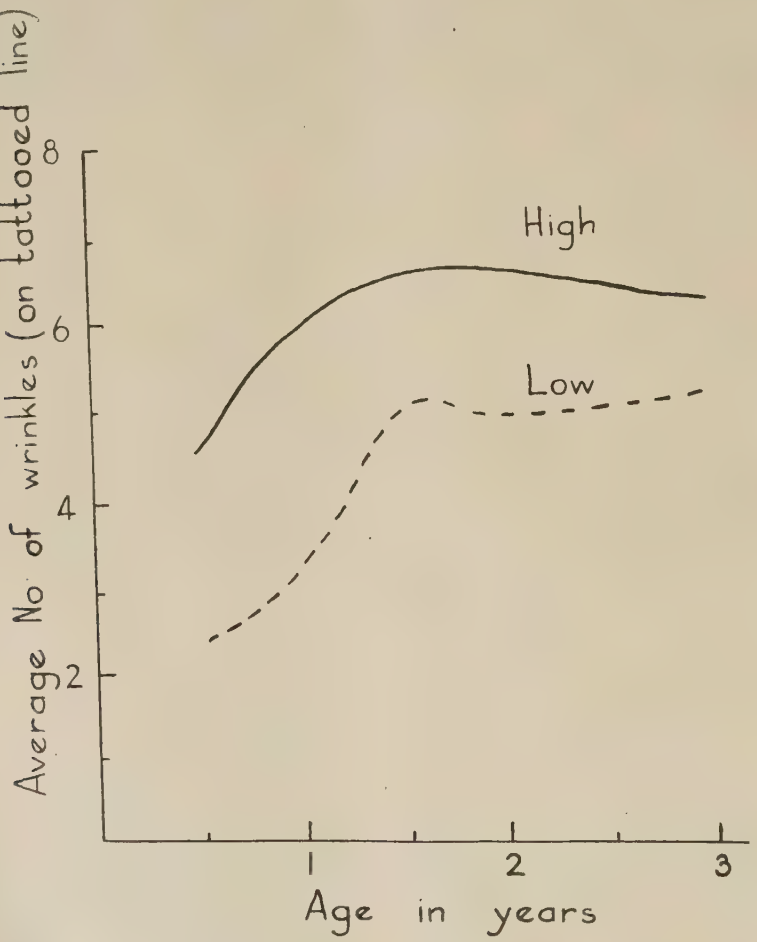


Fig. 3.

Effect of Plane of Nutrition During Growth on Number of Wrinkles in Fine-woolled Merinos.

The rate at which it decreases depends upon the rate at which the skin grows, which in turn is influenced by the way the sheep are fed. Thus, the fibre population falls more quickly in sheep that are well fed than in sheep that are poorly fed. In addition, it falls more quickly in strong-woolled sheep than in fine-woolled sheep, because the skin of strong-woolled sheep can grow more quickly than that of fine-woolled sheep. The way that the follicle population falls as sheep get older is shown in Figure 4.

Fibre thickness is also influenced by the way young sheep are fed. You can make an inherently strong-woolled sheep grow a 50's count fleece or you can starve it down to be a 70's. Similarly, you can feed a fine-woolled sheep up to make it grow a 64's, or when it is poorly fed it will grow a fleece of

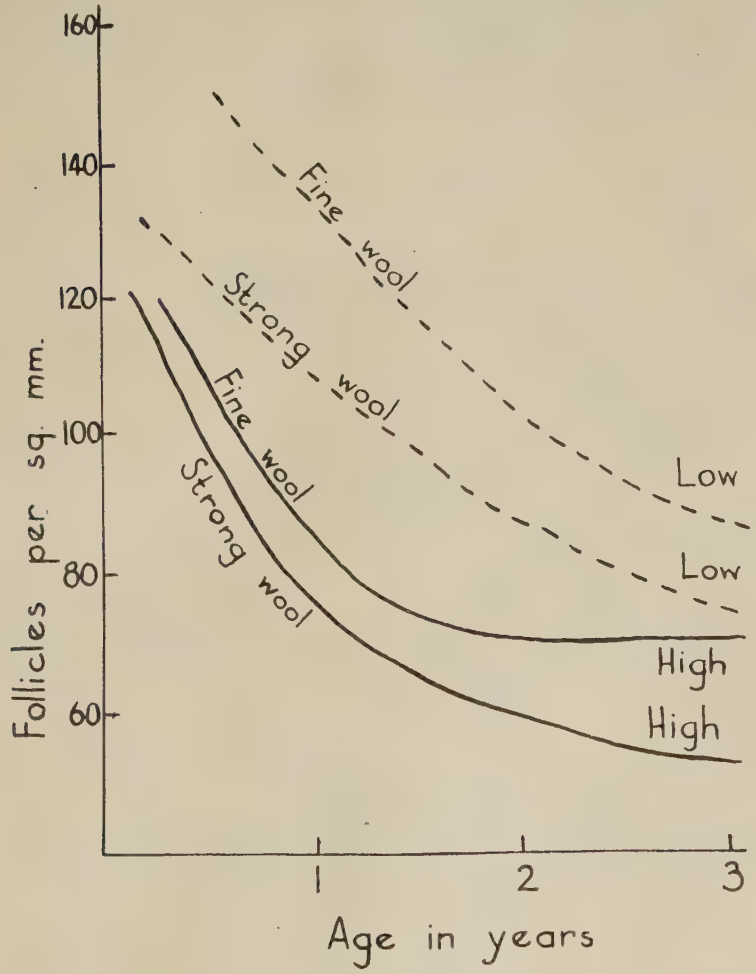


Fig. 4.

Effect of Plane of Nutrition During Growth on Follicle Population Density in Merinos.

100's count. The extent to which differences in feeding affect the wool growth of fine-woolled and strong-woolled sheep is shown in Figure 5.

Staple length is really a measure of the rate at which the wool fibres grow. If they are growing quickly they will grow a long-stapled fleece. If they are growing slowly they will grow a short-stapled fleece. Strong-woolled sheep that are well fed grow their fleeces quickly; if they are poorly fed they grow less quickly. Similar changes occur with fine-woolled sheep, but the fleeces of poorly-fed strong-woolled sheep grow more quickly than those of well-fed fine-woolled sheep. This is shown in Figure 6.

The amount of clean scoured wool grown on each unit area of skin is one of the all-important gauges of the way sheep produce. This also varies with the way sheep are fed and their inheritance. Well-fed sheep produce at their maximum when they are about one-and-a-half years of age. Poorly-fed sheep may not reach their maximum until they are about three years old. Fine-woolled sheep that are well fed will produce more heavily than strong-woolled sheep that are poorly fed. This is because they grow more fibres per unit area; the fibres are of greater diameter and they grow more quickly.

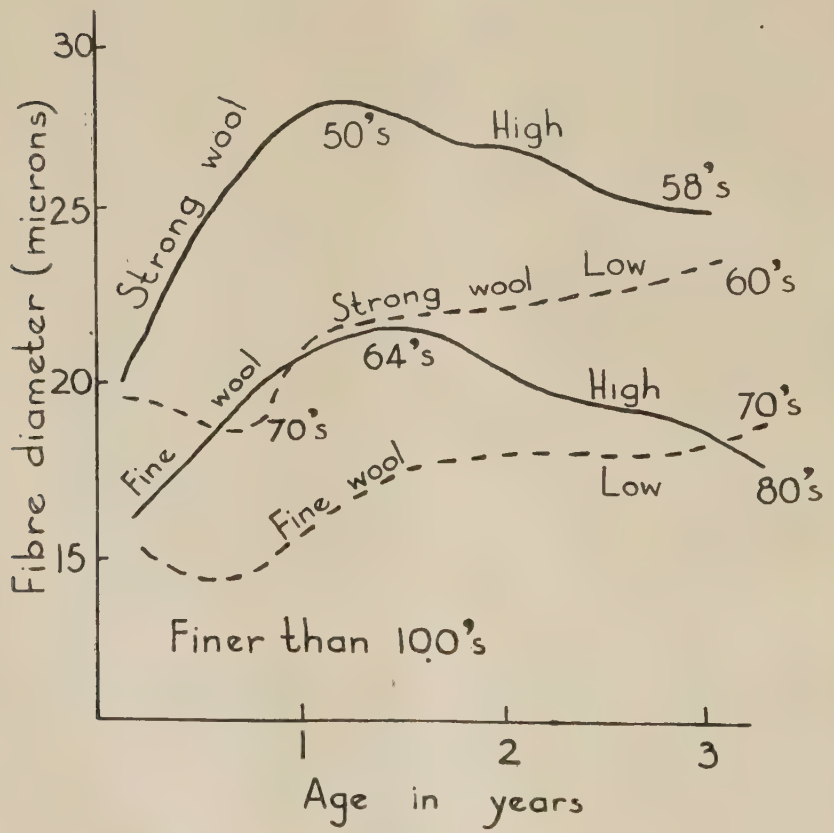


Fig. 5.

Effect of Plane of Nutrition During Growth on Fibre Thickness in Merinos.

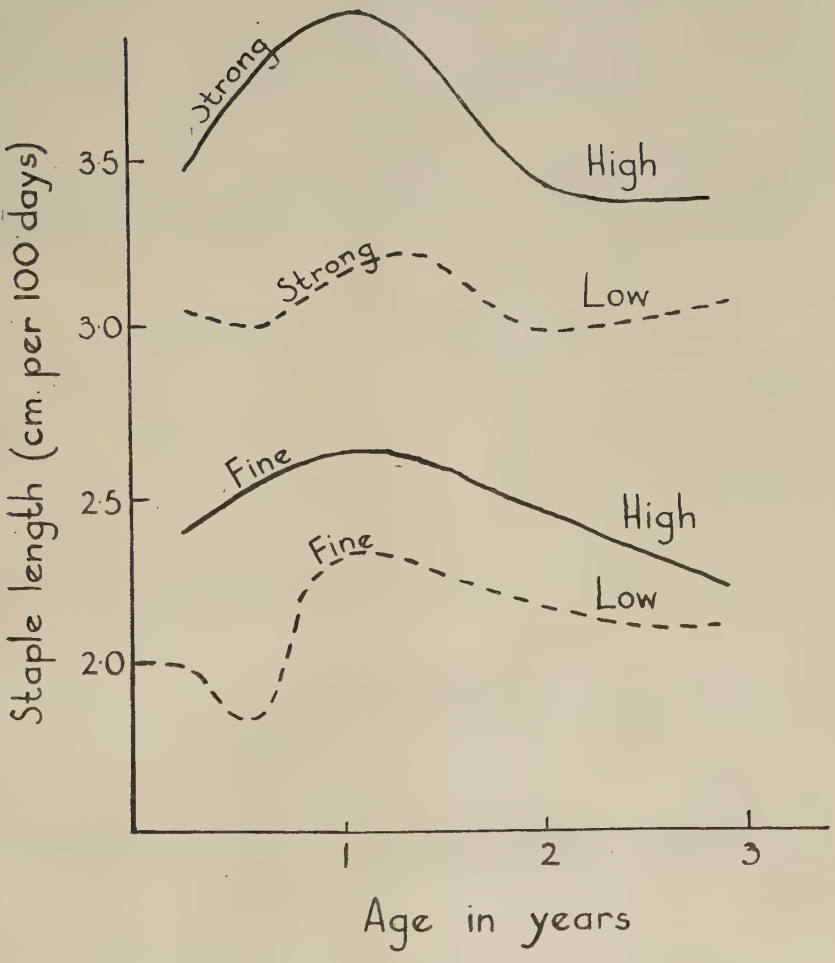


Fig. 6.

Effect of Plane of Nutrition During Growth on Staple Length in Merinos.

The differences between the amount of clean scoured wool produced per unit area by strong-woolled and fine-woolled sheep that are well and poorly fed are shown in Figure 7.

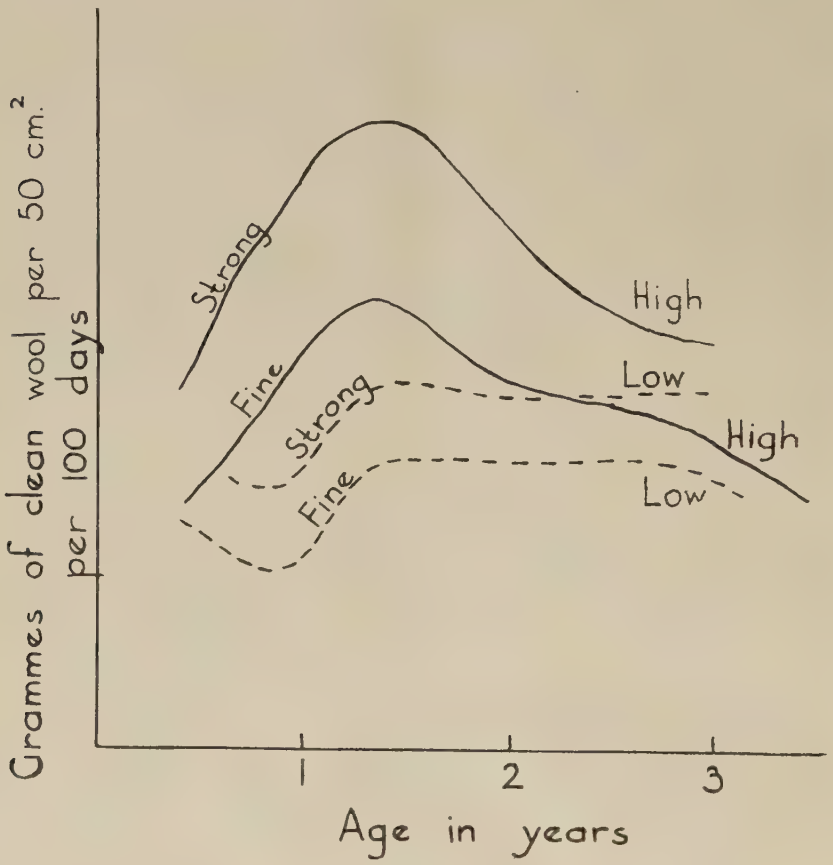


Fig. 7.

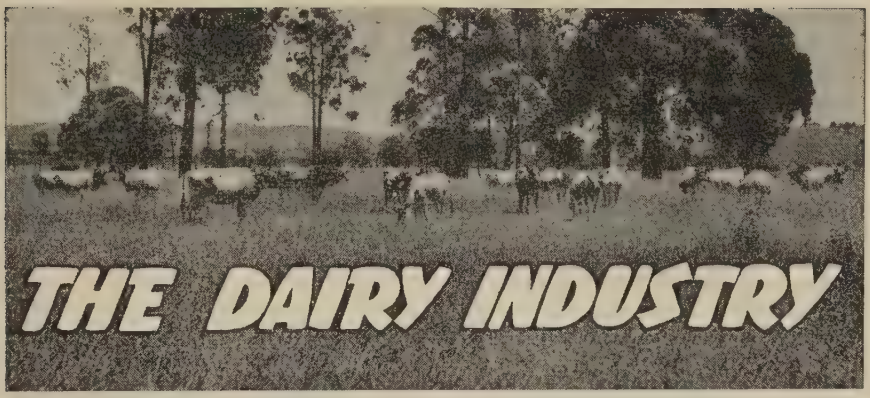
Effect of Plane of Nutrition During Growth on the Production of Clean Wool Per Unit Area of Skin in Merinos.

ADVISORY SERVICE TO WOOL INDUSTRY.

Queensland's sheep and wool advisory services have been strengthened considerably by the recent appointment of four Sheep and Wool advisers. Three of them will serve the Merino sheep industry in central Queensland and the other will work on fat lamb raising farms in coastal Queensland.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said two of the new advisers are staffing the Sheep and Wool offices of the Department at Winton and Blackall, which have been without an adviser for some time; the third will establish a new office at Muttaburra. The adviser in fat lamb raising will be stationed in Brisbane.

The advisers are Messrs. G. Le Gros, Muttaburra; F. M. Benjamin, Blackall; R. D. Oakes, Winton; and J. Nation, Brisbane.



The Nutritive Value of Dairy Products.

By W. F. SCHUBERT, Biochemist, Dairy Research Branch.

Modern living is a complicated, strenuous business involving much mental and physical stress and strain. Consequently, if we are to lead healthy, active lives it is axiomatic that we must feed ourselves in the proper fashion. We can only do this if we know something about the relative merits of foods, and plan our meals so that our diet is adequate.

In grandmother's day life was much less complicated and certainly less strenuous, and the planning of an adequate diet did not offer many problems. Today, the study of food and the establishment of the principles by which the sufficiency of a diet can be measured is the specialised province of a science—the science of nutrition.

For practical purposes food may be defined as any substance, solid or liquid, which when swallowed provides the body with "material and energy necessary for its growth, continuity of existence, and power of reproduction."

A substance is classified as a food if it contains one or more of the following nutrients.—

(1) Carbohydrates, which provide the body with energy.

(2) Fats, which provide a store of energy and also act as a solvent for valuable vitamins.

(3) Proteins, which provide material for the growth and repair of body tissues.

(4) Mineral salts, which provide material for growth and repair and the regulation of body processes.

(5) Vitamins, which regulate body processes.

A few foods contain only one of the above. However, most foods are mixtures and contain several nutrients. A perfect food would contain all of the above nutrients blended in the correct proportion in water, which the body requires to transport the food to the body cells and to carry away the waste products.

The perfect food, of course, does not exist, but a very close approximation to it is milk.

The animals domesticated for the production of milk are all herbivors (grass-eaters) and with the exception of a few are ruminants (cud-chewers). This is probably the result of economic adjustment, as these animals convert otherwise useless grass into a first-rate foodstuff.

This article is concerned only with the nutritional aspects of cow's milk and the products manufactured from it.

Composition of Cow's Milk.

The composition of cow's milk is extremely variable, depending upon such factors as breed, age, feeding, season of the year, and stage of lactation. Consequently, any table showing the composition of cow's milk can only quote average figures for the various ingredients. The following is the average composition of 100 grams (about one-sixth of a pint) of milk.

Major Constituents.		Minerals.		Vitamins.	
Water	87·6 grams	Calcium	0·7 grams	Vitamin A	160 International Units
Total Solids	12·4 grams	Phosphorus		Carotene	
Proteins	3·3 grams	Iron		B1	0·04 milligrams
Fat	3·6 grams	Copper		B2	0·17 milligrams
Carbohydrate	4·7 grams	Sodium		Nicotinic Acid	0·10 milligrams
Calories	66	Chlorine		Vitamin C	2 milligrams

Water.—The water of milk, which is the fluid we all know so well, serves two purposes in milk. Firstly, it holds the other constituents in suspension or in solution. The carbohydrate (lactose or milk sugar) and portions of the minerals and proteins are dissolved, while the fat and the remainder of the minerals and proteins are suspended in the form of very small particles. Secondly, it dilutes the solids to such a bulk that it forms the ideal food for the young calf.

Total Solids.—The total solids of milk include proteins, fat, carbohydrate (lactose) and minerals.

Proteins.—The proteins of milk consist mainly of casein and albumin. These proteins contain most of the known amino-acids required for the growth and repair of body tissue.

Fat.—Milk fat is a mixture of fats, most of which are liquid at ordinary temperatures. Milk fat exists in the form of very minute globules and is thus very easily digested.

Carbohydrate.—The carbohydrate of milk is lactose, which contains the same chemical elements as cane sugar but differs in certain of its chemical and physical properties. It is less sweet to the taste and is not so soluble in water as in cane sugar.

Mineral Salts.—The most important minerals in milk are calcium and phosphorus, which play an important part in the building of the skeleton of the young child.

Vitamins.—Milk contains most of the known vitamins and is especially prized because of its generous supply of preformed vitamin A and members of the vitamin B complex.

Importance of Milk in the Diet.

Every person is born a potential milk drinker and most civilized peoples consume milk in some form or other. In those countries where milk is a scarce article of food, babies are kept at the breast for much longer periods than in more fortunately endowed countries, so that they may be given a decent nutritional start in life.

Those peoples in whose diet milk plays an important part are characterised by "fine physique, good health, and virility."

Nutritionally, milk is a prized food because of its proteins of good type, because of its fat which is not only a store of energy but also a solvent for valuable vitamins, because of its lactose which is a source of energy and which is thought to exert beneficial effect on the bowels of both child and man, and because of its generous content of vitamin A and members of the vitamin B complex. In addition, it is a rich source of both calcium and phosphorus, which play an important part in the building of the skeleton.

As the child develops and it becomes capable of digesting more solid foods, its requirement of milk decreases. But this does not in any way reflect upon its nutritional significance. It has been

proved, in fact, that an adult could survive on a milk diet alone if he were prepared to consume about a gallon a day. Just imagine milk being delivered on the front doorstep in cans instead of bottles! Thus it is true that milk is a good food for people of all ages.

According to Kon (of the National Institute for Research in Dairying, England), the chief value of milk in the adult diet is its capacity to supplement other foods. This enhancing effect he attributes to the contribution of calcium, vitamin A and members of the vitamin B complex, and to the supplementary relationship between milk proteins and the proteins of other foods.

Since the war the governments of most democracies have instituted free milk schemes in schools, and it is interesting to note that since the introduction of such a scheme in England rickets has virtually disappeared.

Milk is a necessary food for pregnant and lactating women. The development of the unborn child and the secretion of breast milk make demands for minerals, proteins, and vitamins which milk is best suited to satisfy.

Although the scientific evidence is not complete, milk would seem to be an important article of diet in old age, as in the other stages of existence. Summing up, Kon says, "To put it cynically, the second childhood deserves perhaps the same sort of priority for milk as the first."

Pasteurised Milk.

The fear is still sometimes expressed that pasteurised milk is not as nutritious as raw milk. This fear has its roots in a prejudice against the heat treatment of dairy products. In pasteurisation, milk is subjected to a temperature well below the boiling point of water to destroy the pathogenic (disease-causing) organisms which might have entered the milk. This temperature is well below that to which many of our foodstuffs are subjected in the kitchen.

Actually, exhaustive experiments have failed to reveal any significant differences between the nutritive values of raw and pasteurised milk. There are some slight losses in the vitamin B and vitamin C contents of milk, but these are usually considered to be insignificant. In the final analysis, the populations of our large towns and cities who have almost exclusively been reared on pasteurised milk are not exhibiting any signs of gross malnutrition.

Non-Fat-Dry-Milk Solids.

Milk from which butterfat has been removed has always been regarded with suspicion as a foodstuff. This can only be considered as unreasonable. For separated milk, though deprived, it is true, of butterfat and vitamin A, is nevertheless an excellent foodstuff. It is rich in protein, which is the "meat" of milk, and contains most of the other nutrients of wholemilk. It can be conveniently prepared in the powdered state by means of roller or spray drying. In the dried state it is marketed under the name of Skim Milk Powder or Non-Fat-Dry-Milk Solids.

Butter.

Weight for weight, butterfat furnishes a supply of energy equal to that of other fats. In addition, it is almost completely digestible and carries all the known fat-soluble vitamins. Butterfat is readily absorbed in the intestines because it is in a state of very fine subdivision. Also, the majority of fats which compose butterfat are liquid at body temperature. Fats which are solid at body temperature are apparently excreted unutilised by animals. As mentioned previously, milk fat is noted for its generous content of pre-formed vitamin A.

Cheese.

Cheese contains many of the ingredients of milk in concentrated form. For this reason it is considered an excellent substitute for meat in the diet. It contains approximately four-fifths of the original calcium and two-thirds of the original phosphorus. Actually,

cheese contains about three times the phosphorus content of beef and more than 12 times the phosphorus content of potatoes.

With the decline in meat-eating in Australia, it is felt that more cheese should be eaten as a food in order that proper phosphorus levels may be maintained. In the past we have been inclined to look upon cheese as a luxury article of diet.

Since most of the fat of the original milk remains in the cheese, much of the fat-soluble vitamin A is found there also.

During manufacture, one-fifth of the protein, almost all of the lactose (or milk sugar) and a large part of the thiamine and riboflavin content of milk are transferred to the whey.

Condensed Milk.

According to Kon, unsweetened condensed milk loses some 60% of the vitamin C and 30-35% of the vitamin B originally present, whilst sweetened condensed milk may contain only some 10% less vitamin C and 5% less vitamin B than the equivalent quantity of raw milk from which it was made. Because of its lack of vitamin A, condensed milk is unsuitable for infant feeding and must be labelled as such.

Ice Cream.

Ice cream, once considered a luxury, is now consumed as a major item of food. Analytical figures on the food value of ice cream are very limited and apply only to a few ingredients.

Substitutes.

This is an age of substitutes and substitutes for some dairy products have appeared on the market. The nutritional value of some of these cannot be gainsaid. The consumer is usually very sensitive to flavour, and the characteristic flavour of high-quality dairy products is very difficult to imitate. This aspect gives dairy products a great advantage. But this advantage can only be capitalised upon if the quality is high and the products are attractively packaged and marketed. The nutritional value is beyond dispute.

RECONSTITUTED MILK TRIALS.

New home and export markets for certain Queensland dairy produce may be developed following successful trials carried out on reconstituted milk by the Department of Agriculture and Stock.

Reconstituted (or recombined) milk is made up by mixing together the correct proportions of skim-milk powder, water and butter oil to produce milk from its dehydrated constituents.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said the reconstituted product offered possibilities for use as milk in certain areas of Queensland where there are often seasonal shortages of market milk. In addition, skim-milk powder and butter oil may be exported to some Asian countries where there is a ready market for these products.

Various methods of processing the reconstituted product are now being examined by officers of the Dairy Research Branch of the Department in an effort to evolve the most economic method.

Efforts have been made to improve the flavour of reconstituted milk, both in the processing of the skim-milk powder and butter oil and by modified methods of reconstitution. Further work along these lines is in progress.

Recent Developments in Rapid Cheesemaking.

By T. A. MORRIS, Asst. Dairy Technologist, Dairy Research Branch, Division of Dairying.

Under pressure from the prospect of declining returns, cheddar cheese manufacturers have intensified their search for ways and means of reducing production costs. The possibility of reducing the time required to make a vat of cheese has been high up on the list of "means."

The development of fast single-strain starters and the gaining of a better understanding of the technology of cheesemaking have already reduced cheddar cheese manufacturing time by almost 2 hours, from over 6 hours to under 5 hours.

Opinion has now firmed that no further reduction in this manufacturing time can be achieved by adhering to the orthodox cheesemaking procedure. Some consider that the elimination of the cheddaring and milling stages and the production of a "stirred curd" type of cheese is a most promising course to follow.

The Stirred Curd Process.

The stirred curd process has been employed to some extent in America for many years, but up to the present time it has not been regarded as a replacement for the cheddar process. One factory in Queensland has been producing a variety of stirred curd cheese for many years, while at least three others have occasionally manufactured this type of cheese. The process has been under investigation by the Dairy Research Branch of the Division of Dairying of the Queensland Department of Agriculture and Stock for two to three years.

While it has been found possible to use the stirred curd process to produce cheese of good quality with a reduction in manfacturing time of about 1½ hours, research is being continued in an endeavour to reduce the incidence of certain defects.

Openness of texture is one defect which arises, and experimental cheesemaking is being carried out from time to time with the purpose of determining the factors which control the occurrence of this defect. For instance, indications have been obtained that it is better to stack the hoops of curd for a short while before dressing them than to put them under heavy pressure immediately they are filled. Improved methods of controlling the acidity and the moisture content are also being sought.

As well as reducing the manufacturing time, the stirred curd process offers the possibility of a high degree of mechanisation. Kraft Foods Ltd. has brought this possibility to reality at its Leitchville cheese factory in Victoria. At this factory pumping of the curd and whey, after cooking, to a draining and salting vat fitted with mechanical curd stirrers has eliminated much of the labour involved in the process (Plates 1 and 2).

Introduction of Streptococcus durans.

In 1953 reports were released of a new process developed by American research workers. In this process an unusual type of starter culture called *Streptococcus durans* was used and the resistance of this starter to both high cooking temperatures and high salt concentrations enabled considerable changes to be made to the orthodox cheddar cheesemaking process.

The removal of moisture (whey) from the curd was speeded up by cooking the curd at temperatures up to 120°F. and the time-consuming and rather laborious procedures of drying, cheddaring and milling the curd were eliminated by keeping the curd in the whey and hooping it under whey. Salt was applied to the curd in the whey so that a brine was formed.

The American process, however, was not really applicable to large-scale manufacture and it possessed certain practical disadvantages. For example, much special equipment was required

Plate 1.

Stirred Curd Cheese Manufacture. In the foreground is the end of a draining vat, and beyond this cheese vats fitted with travelling agitators can be seen. (Factory of Kraft Foods Ltd., Leitchville, Victoria).

and the salt content of about half of the whey became too high to allow it to be used for stock feeding. Nevertheless, the use of the starter *Streptococcus durans* still appeared to be a most promising means of reducing cheddar cheese manufacturing time and it was not long before endeavours were being made to use this starter in a modified procedure.

The Commonwealth Scientific and Industrial Research Organization, working in conjunction with the Victorian Department of Agriculture, experimented with the manufacture of cheese by employing *Str. durans* in a stirred curd process. However, the result was not considered satisfactory, mainly because of defective body and texture in the cheese.

In an endeavour to remedy these defects a return to the orthodox methods of drying, cheddaring and milling the curd was made. The resultant process differed essentially from the normal process only in that *Str. durans* was used in addition to the ordinary *Str. cremoris* or *Str. lactis* starters, the cooking temperature was 108 to 110°F., and the time taken in manufacture was reduced by 1½ to 2 hours (mainly by reducing the cheddaring time). A considerable reduction in normal manufacturing acidities was associated with these changes in procedure.

Early reports of the C.S.I.R.O process were sufficiently favourable to encourage the conducting of experiments with the process in Queensland. Cultures of *Str. durans* were obtained and initial cheesemaking trials were conducted at the Pittsworth cheese factory in mid-1954 and later at the Goomeri cheese factory and the factory of the Queensland Agricultural High School and College at Lawes.

Experimental cheesemaking was carried out to test the process and to adapt it to Queensland conditions. Endeavours to produce fast-maturing cheese for the local cheese trade were also made.

The results of these experiments are the subject of another publication, but in brief it may be stated that they were somewhat disappointing. Much investigation of this "short process" has yet to be carried out before it can be accepted with as much confidence as is placed in the orthodox process.

Time and Patience Required.

It is necessary to realise that the development of new methods of cheesemaking involves much experimenting and patient research. It is possible for the investigation of just one defect in cheese to occupy many years. For example, in spite of over a quarter of a century of intermittent research by dairy technologists in every important cheddar cheese producing country, it is still not possible to explain all occurrences of mechanical openness in cheddar chese. The development of a complete process must therefore be expected to be long-term work.

Although there is good reason to feel that new and better cheesemaking practices will eventually be developed, care must be taken to ensure that long-established techniques are not discarded without serious consideration of the consequences. In the meanwhile, in their everyday work cheesemakers should aim at perfecting existing procedures so that cheese of very good quality is consistently produced. If the cost of production is to remain high, then the quality must be made to match the cost.

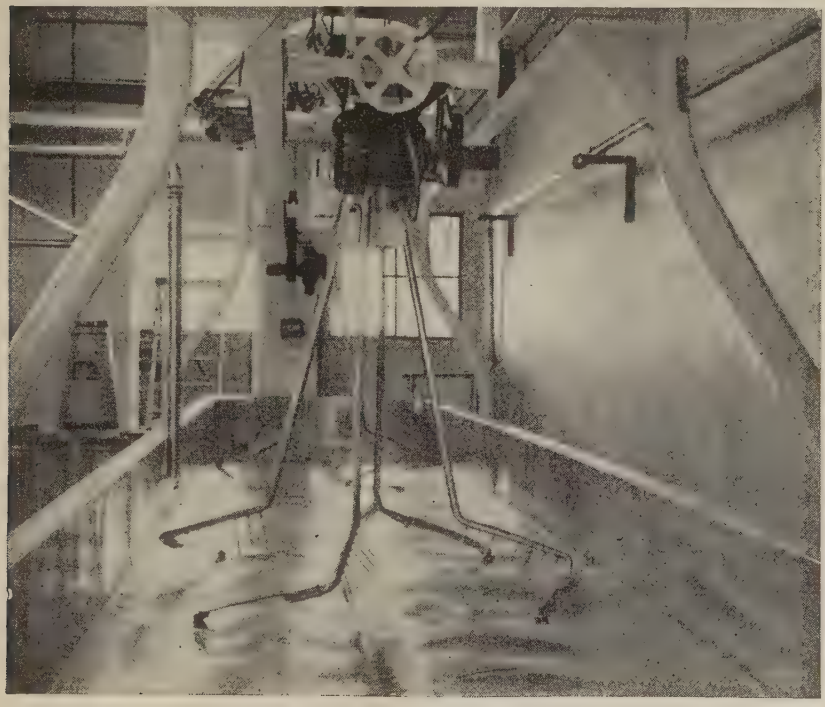


Plate 2.

Stirred Curd Cheese Manufacture. View of draining vat, showing a pair of travelling curd stirrers. A central strip of the vat bottom is perforated to allow draining of the curd. (Factory of Kraft Foods Ltd., Leitchville, Victoria.)

ANIMAL HEALTH

The Threat of Exotic Diseases to Our Animal Industries.*

By W. WEBSTER, Director, Division of Animal Industry.

The dictionary describes the word "exotic" (of plants, words, fashions), as "introduced from abroad." This talk deals with the danger of new animal diseases being introduced from abroad.

Before discussing the likelihood of these introductions into the livestock industries of Australia, let us quickly look at the history of these industries and their present disease status. None of the common domestic breeds of animals are indigenous to Australia, so that when this country was discovered it was virtually disease-free.

Animal introduction was commenced with the arrival of the first fleet, which carried livestock for the supply of fresh meat and milk for rations. From this small beginning, the animal industries have developed by introductions and natural increase to 15,000,000 cattle, 118,000,000 sheep, and 1,000,000 pigs, in less than 200 years. Most European breeds are represented and a few Asiatic. New breeds continue to come in, but with a few notable exceptions they are nowadays mainly domestic pets. The most important new breed introduced recently was the Santa Gertrudis breed of beef cattle from Texas, U.S.A.

Introduced Diseases.

With these introductions over the last 170 years have come some serious complaints. This was particularly so in the early days of settlement, when it is likely most of the common, but less spectacular, infections were introduced. In those days, transport was very slow and acute symptoms would develop before the ship carrying the animals arrived in this country and the affected beasts either died or were destroyed on arrival. Developments in recent years have made the introduction of disease simpler. The first is the speeding up of transport, particularly air travel, and the second is refrigeration, which made possible the carriage of meat as ship's stores from countries where serious diseases exist, for it is by meat and meat scraps that some of the most serious diseases have been introduced or are likely to develop.

It is probable that most internal parasites and less acute diseases such as tuberculosis were introduced very soon after the settlement of the colony; in fact, it is not inconceivable that they came in the first fleet. These common complaints cause serious economic loss, but are usually capable of control.

Tuberculosis is now being eradicated by testing schemes in all States, and in Queensland, with a few exceptions, all dairy cattle are included in a tuberculin testing scheme developed by the Department of Agriculture and Stock with the assistance of veterinarians in private practice.

Pleuropneumonia, one of the serious infections of cattle, was introduced into Victoria in 1858, and assisted by the bullock team which

* A talk to the Rotary Club of Brisbane.

was then the common means of transport it spread from south to north of eastern Australia in a few years. It is now common in the northern parts of Queensland, Northern Territory and Western Australia, but the central and southern parts of the Commonwealth are virtually free.

Cattle tick was introduced at Darwin towards the end of the last century, and spread along the north coast of Australia, down the east coast of Queensland and into the north-east corner of New South Wales. Cattle tick is responsible for serious economic wastage due to loss of blood and tick worry, but it is also the vector transmitting tick fever and causing heavy losses in cattle.

Mastitis, a disease affecting the udders of cattle in all countries of the world, is also widespread. Sterility and abortion due to infectious or contagious complaints are present in Australia, as they are in other parts of the world.

Many of the common diseases of pigs, particularly pneumonia, enteritis and dysentery, are present, as are a variety of poultry diseases. With the exception of strangles, there are very few horse conditions of an infectious or contagious type.

Not Established Here.

Despite this imposing list, it can be truthfully said that the most serious epidemic infections of domestic animals do not occur in Australia, particularly the spectacular infectious or contagious diseases which develop rapidly, causing serious and widespread deaths and economic loss.

To mention only a few: In cattle, we have no foot and mouth disease, rinderpest, or haemorrhagic septicaemia. In horses, we have no glanders, surra, equine infectious anaemia, or equine encephalomyelitis. In poultry, we have no fowl plague, or Newcastle disease. In pigs, we have no swine fever, foot and mouth disease, or rinderpest. In dogs, we have no rabies.

Some of the names of the above formidable list will be familiar to you, particularly foot and mouth disease and rabies, but I can assure you that these diseases, with the inclusion of pleuropneumonia, anthrax and tick fever (all three of which are present in Australia), represent the serious animal diseases of the world. It can be truthfully said that Australia and New Zealand are virtually free, and may they remain so!

The risk is always present and some of those diseases mentioned have been introduced, have developed to a greater or lesser extent, and have been stamped out.

In 1923, rinderpest broke out in Western Australia. This is perhaps the most virulent and acute infection of bovines. The death rate can be as high as 90% of the highly susceptible infected cattle in a country where the disease has not previously occurred. Stock normally affected are cattle, buffalo, camels, sheep, goats and pigs. The infection in Western Australia came from ship's refuse.

An area surrounding the outbreak was placed in quarantine. Outside this, a standstill area was arranged and slaughter of all susceptible cattle carried out in the infected area. Veterinary assistance was supplied from other States and the Commonwealth, and the disease was stamped out.

Swine fever was introduced to New South Wales, Victoria and South Australia in 1927-1928. The original infection came into Victoria in food refuse from an overseas vessel. It was probably contained in scraps of pig meats from pork, bacon or ham obtained from a pig in the early stages of the disease and taken onto a ship as ship's stores in a country where the disease was prevalent. The food scraps are usually thrown overboard when at sea, but in port should be destroyed. On this occasion, the scraps were taken to a piggery, where the disease broke out. In the interim, however, pigs had been sold and some had been sent

to South Australia and New South Wales and bought by local pig farmers. In no time, the disease, which is highly infectious, broke out in the three States. Again, quarantine was imposed on the infected properties and all pigs destroyed and burnt. After the slaughter of some thousands of pigs, the disease was stamped out in each of the States.

During 1942-43, when there were big concentrations of troops in Australia, American pig meats, despite repeated warnings, were unloaded from American ships in Western Australia and New South Wales. The scraps from these meats were eventually collected by pig farmers and swine fever broke out on their properties and on others to which contact pigs had been sold. In a short time, the disease was spread over a wide area surrounding the cities concerned. Quarantine and slaughter-out policy was adopted and again the disease was stamped out.

In 1930 to 1932, Newcastle disease, one of the most serious acute infectious diseases of poultry, was introduced into Victoria, but it was entirely eradicated and has not occurred since

These are some of the happenings of more recent years, when it has been possible, because of the presence of trained staff, to take prompt and drastic action to stamp out introduced diseases by the slaughter-out method.

What the present disease position in other countries of the world? Foot and mouth disease of cloven footed animals is present in Asia, Europe, Africa and South America. It is only Australia, New Zealand, Canada and U.S.A. that are now free of the disease. Rinderpest occurs in Asia, Africa and some of the countries north of Australia. Rabies is common in most countries of the world, except Australia, New Zealand and the British Isles.

Serious horse diseases are present in most countries of the world except Australia, New Zealand and the British Isles. With this knowledge, one can understand the prohibition of the entry into Australia of certain horses for sporting events, for such introductions could, without showing any symptoms, be affected with diseases that could be spread by insect vectors from the moment they arrived in the country. This spread could extend not only to the horses in industry, but to those used in sport, which after all is one of our major industries.

Of the diseases, the most serious are glanders, equine infectious anaemia, surra and encephalomyelitis, a brain disease transmissible to humans, and preventing the introduction of horses from America. Glanders did occur in horses introduced into Australia on one occasion, but with the slaughter of these and some contact Australian horses, it was stamped out. Equine infectious anaemia was spread throughout the Pacific by the Japanese during the last war, as were a number of other complaints.

Swine fever, the most serious disease of pigs, is not present in Australia, all previous introduced infections having been stamped out.

Whilst we have our share of the serious diseases of poultry, we are free of some of the most important in Newcastle disease, fowl plague and chronic respiratory disease.

In our huge sheep industry, we have some serious problems, but are free of epidemics such as bluetongue, sheep scab and sheep pox.

Precautions Taken.

It might help at this stage if we consider what precautions are now taken to prevent the introduction of animal infections into Australia. The legal powers to do this are contained in the Commonwealth Health Act. The control of animal disease within the Commonwealth is carried out by State Veterinary Services. The Commonwealth therefore have appointed a veterinarian in charge of the control of stock introduction, or as it is more commonly known, animal quarantine, and with the agreement of each State

appoints their veterinary staff Quarantine Officers under the Commonwealth Act. This is a very satisfactory arrangement, for the staff who are concerned with control of disease in the State and are aware of the dangers of exotic infections are naturally very keen on preventing their introduction.

You will remember that the two countries free of serious animal diseases are Australia and New Zealand, and generally speaking, livestock are allowed to enter Australia from the latter country. Whilst the British Isles are not entirely free, the control is good and there is a complete exchange of information between the two countries. The introduction of cattle is allowed from certain areas of the United Kingdom, as is that of dogs and horses. Cattle and dogs, however, must go into quarantine at the port of entry, and also undergo a period of quarantine at a special station in England before shipment.

Cattle only can be imported from U.S.A. during a restricted period of the year.

No livestock are allowed into Australia from other countries. The only ports of entry for accepted animal migrants are at the capital cities of the States, where a special quarantine station is provided. In these ports, all vessels are boarded and ship's pets placed in quarantine on the ship on the bond of the Master. Ship's refuse must either be held whilst the vessel is in port, or removed under supervision for destruction. In each capital city, there is a full-time staff constantly watching overseas vessels to see nothing is brought in which would endanger the health of the livestock of the Commonwealth. The thoughtless introduction of foodstuffs which may eventually find their way to the pig troughs could cause, and has done, outbreaks of swine fever and foot and mouth disease, causing serious financial loss to the individual, and may permanently affect the economy of an industry.

Recently in Canada, foot and mouth disease broke out in the middle of the country. It was hard to believe that this had happened hundreds of miles away from a sea or air port where stock or animal products would normally come in. For this reason, it was not quickly recognised, being confused with a condition having similar symptoms. When it was finally diagnosed, quarantine was imposed and a slaughter-out policy successfully completed. It was eventually discovered that a European migrant had come straight from a farm in Europe where foot and mouth disease existed, and within a few days had commenced work on a farm in Canada. The virus of the disease was apparently carried on his clothing, or on foodstuffs he may have brought with him.

The same disease broke out in Mexico, said to be due to the ill-advised introduction of animals. It spread quickly, and although a slaughter-out policy was adopted with the assistance of U.S.A. finance and manpower, the spread was too great and inoculation had to be resorted to.

Following World War I, a dog was smuggled by air from France to England, resulting in an outbreak of rabies, which took years to stamp out.

These various happenings have been mentioned to indicate how easily serious animal diseases can be introduced into a country.

Vigilance Essential.

What is the chance of disease introduction into Australia?

With one exception—the introduction of rabies into northern Australia—I would say that under our present system of quarantine and constant vigilance the likelihood of introduction by animals is slight. With rabies present in countries not far north of Australia, and remembering the likelihood of illegal entry by the crew of fishing vessels, the possibility of a rabid dog being brought in is real. If

this disease ever came in and affected the wild dog in Australia, it would be indeed difficult to control.

It is probably more likely, however, that disease would be introduced as it was in Canada—by humans or by animal refuse, as has occurred with swine fever on two previous occasions. Whilst I was overseas last year, I naturally discussed this possibility with veterinarians from other countries and they felt that, particularly with foot and mouth disease, which is so widespread in other countries, we would need not only constant vigilance but our share of good luck to keep it out. The active immigration policy and the expanding interchange of goods and passengers by air and sea make the likelihood of disease introduction by mechanical carriers or by animal products very real.

Since the Canadian outbreak, all migrants' effects have been examined and fumigated, and it has been observed that boots and work clothes bearing evidence of having been used in cowyards overseas and packed without cleaning are not uncommon in these effects. Foodstuffs not usually manufactured in Australia are often found both in these effects and in parcels sent from the homelands of recent migrants. The Customs and Quarantine staff are doing an excellent job, but they cannot be expected to see everything and it is here that good luck will be needed. Let us hope that these exotic diseases will be kept out, but if they do inadvertently come in, let it be in closely settled country where, although the cost may be great, control and eradication will be possible. Let us hope that introduction does not come to northern Australia, where it could smoulder and spread unnoticed for a long time in the wild pigs, buffaloes, and cattle of these areas, where the human population is so sparse.

Let me finally say that it is not smart to introduce unnoticed anything that could cause the spread of serious disease to the nation's livestock, for an outbreak in these industries could affect the whole economy of the nation.

PIG-RAISING DEMONSTRATIONS.

Farm demonstrations in pig-raising are being carried out in Queensland to assist in improving the quality of pigs marketed and, at the same time, to show farmers how to make the best use of their pig-feed.

Stating this recently, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said these demonstrations are already proving their worth. They are supervised by officers of his Department, and co-operating farmers are now consistently marketing prime grade baconers. The demonstration farms serve also as centres for field days where new practices are shown to all pig-raisers in the district.

The demonstrations cover molasses feeding in north Queensland, grazing of pigs, and running pigs on deep litter in small crop areas.

Grazing conditions with portable accommodation for dry sows and growing stock approach the ideal in economic pig husbandry. It can be applied equally well on both dairy and grain farms, and demonstrations already established are attracting a great deal of attention among local farmers.

A new demonstration has been laid down in the Kilcoy area where a paddock has been planted with kikuyu to provide a source of green feed for spring grazing. Portable sheds have also been built. At Upper Caboolture, grazing is being carried out on a stand of white panicum, and at Mt. Beppo automatic waterers have been installed.

In North Queensland it has been shown that molasses may be used to replace up to one-third of the grain in the ration fed to pigs, provided the animals are also fed adequate fibre. Molasses feeding is likely to be used extensively in the north where molasses is cheap.

Mr. Collins said these demonstrations are being carried out under the Commonwealth Extension Services Grant.

MARKETING

Co-operative Marketing in Queensland—Some Post-war Developments.*

By C. H. DEFRIES, Assistant Director of Marketing.

The last decade has seen vital changes in markets and techniques. It is therefore pertinent to ask: How has co-operative marketing fared during this period? What weaknesses have been revealed? What vigour has been demonstrated?

This period has been a testing time. Two developments in particular have presented a critical challenge to marketing organisations.

Firstly, there are the radical changes in the market itself, both overseas and within Australia. The period of assured markets, rigid controls and Government trading that existed during the war and post-war period has come to an end. Open market conditions bring considerable uncertainty. The emphasis has shifted from a single-pointed drive to attain the maximum possible production with limited resources to a much more complex situation where a high level of production is still the aim but where matters of price, selling policy and quality of production are also vitally important. And of course running parallel to this is the increasing demand for rural products within Australia itself as our population increases.

Secondly, there are the technical developments which followed the war, and the fact that with the rapid advance in communications the whole tempo of commercial life has increased. The complexity of the factors which have to be taken into account these days when making decisions makes those halcyon pre-war days seem a succession of lazy Sunday afternoons. Science has brought solutions to old problems and outlined many new ones to cope with. Machinery has been growing bigger and better, displacing labour in many of its traditional roles.

If we survey the record of the nineteen marketing organisations set up under the Primary Producers' Organisation and Marketing Acts which are now functioning in Queensland one cannot help but be impressed by the progress that has been made. They have met and are meeting these two broad lines of challenge with considerable success. Queensland has always been proud of its system of organised marketing, and rightly so. We led the world in its initial development and over the years there have come forward men of outstanding ability and drive to provide the kind of direction and administration required by such dynamic times as these.

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* An Address to the Annual Congress of Co-operatives.

There is not one of these organisations which has not had fundamental problems to face, readjustments to make and unexpected developments to cope with.

At this point one is tempted to embark on the detailed story of what each organisation has done. There is not time for that, of course, but perhaps I may be permitted to outline some of the highlights.

There is, for instance, a very long story to be told on tobacco. The Tobacco Leaf Marketing Board was one of those organisations set up following the war to take the place of the war-time marketing scheme under National Security Legislation, only on a State basis, of course. It is a story of signal success and one that will not be finished for many years to come. May I go as far as to say that if ever an industry has had demonstrated to it the value of strong and virile organisation it has been the tobacco industry during the past three or four troublesome years. During this period what the growing industry needed above all else was something that would combine all the scattered units with their varied outlooks and interests into one cohesive and effective body so that it would be an effective link between growers and Governments whereby its voice could be heard in quarters so vital to its welfare. And it has had just that. Now, fortunately for the industry, we have reached the point when the Board has the solid backing of producers and the respect of Governments and industry alike.

The Cotton Marketing Board also has provided an effective link between the cotton growing industry and Governments in regard to the establishment of stabilised conditions for the industry. In both of these industries, of course, decisions on a Commonwealth Government level have a vital impact because of the effect on them of the Government's fiscal policy. Mention might be made, too, of the Cotton Board's activity in blazing the trail on behalf of the mechanical harvesting of cotton. It would have been beyond the capacity of any private individual or business firm to carry out the exploratory work in this field as the Cotton Board has done, and we may well hope that through the efforts of the past few years the industry will be established on a sound economic footing.

To give another example—little is heard of the remarkable success of the Barley Marketing Board in putting on to the world's market a Queensland malting barley which has gained full recognition of its merits in the face of a traditional attitude that Queensland barley is not of much use except for feeding livestock.

Again, the success of the Butter Board in establishing overseas markets for butter concentrate and ghee has been an important development for the dairying industry since the war.

The expansion of the Committee of Direction of Fruit Marketing in the last decade has been phenomenal. Last year the total turnover of the C.O.D. organisation was nearly £10,000,000, which is an increase of £7,000,000 in seven years. This represents a vast complexity of activities having to do with the selling of fruit and vegetables, ranging from the organisation of supplies of Queensland fruit and vegetables to southern markets when floods or strikes interrupt railway communications to running the large cannery at Northgate and the extensive

wholesale businesses it now has established in Queensland and New South Wales. The C.O.D. is now a thriving and bustling organisation geared to attack any marketing problem of the future with the same foresight and drive which has brought it to its present commanding position.

One important development in our marketing system that is worthy of comment is the association of some Boards with Commonwealth marketing systems. It will be recalled that in 1946 a referendum on marketing was held throughout the Commonwealth. However, powers to organise primary products marketing on a Federal basis were denied.

The wheat industry, particularly, was in need of such a Commonwealth-based scheme and after considerable discussion a way to give effect to this was devised by having each State Parliament provide powers complementary to Commonwealth legislation so as to continue in a modified form the war-time wheat marketing plan. A wheat marketing scheme has continued to operate whereby the Australian Wheat Board is charged with the responsibility of marketing the Australian wheat crop and the State Wheat Board, with its State legislation intact, is fitted in as an integral part of the marketing structure. The latter Board is, in fact, the sole licensed receiver and agent of the Australian Board in Queensland.

At the close of last year Parliament enacted legislation to give effect to a further extension of the wheat stabilisation and marketing scheme which will continue in operation until 1958. This is of fundamental importance to wheat growers at the present time in view of the overseas grain marketing situation, as it guarantees cost of production for 100 million bushels of export. Queensland in recent years has, of course, become an exporting State; this year our surplus is over 5 million bushels. It is of interest to note the eager preference that exists on world markets for our Queensland wheat because of its high quality—to the extent that buyers are prepared to pay substantial premiums to get it.

Whilst we are on the subject of the Wheat Board mention might be made of the problem presented to that organisation by the rapid growth of the industry. Before the war we produced an average of 4 million bushels annually. Now this has gone as high as 18½ million and for the past three years has averaged nearly 15 million. Facilities for the handling and storage of these crops had to be provided. But there was something more than merely extra quantities to consider—there was the rapid growth of bulk handling on farms resulting from mechanisation and labour difficulties.

To meet the position the Board has embarked on an extensive programme of building at country centres and at Pinkenba. The latter will be the main port bulk handling terminal. Some of the silos in country centres have been completed, others are under construction and yet others are planned. It was necessary to provide a temporary installation at Pinkenba to handle the export wheat of recent years and tenders will soon be called for a permanent bulk handling installation.

The war-time control of the egg industry has also evolved into an Australia-wide organisation, although in this case the Australian Egg Board is concerned only with the export market. Queensland is

represented on it by a delegate from the State Egg Board and it is the organisation through which our Board here exports its surpluses of eggs.

These are merely a few of the highlights. In many other industries —peanut, maize, pig, navy bean and so on, the situation has been comparable, if on a lesser scale. It is, I think, fair to say that it makes a formidable array of achievement. And as a footnote to that statement it may be noted that the latest available figures indicate that the total sales realisations of the commodity marketing Boards, excluding sugar, is over £50 million per annum.

Despite this, there has been a good deal of sweeping comment of late years to the effect that marketing boards have failed and that they ought to be abolished. Certainly like many other human institutions they are sometimes less than perfect, but the foregoing suggests that they have served and continue to serve a vital and dynamic role in the development of Queensland's rural industries and are worth while from the point of view of the community generally as well as from that of the farmer himself. Certain aspects are worthy of special recognition.

Firstly, the Queensland system of orderly marketing gives to farmers the protection of collective bargaining and this, as will readily be seen, is analogous to the similar protection given to their members by trade unions and the various professional and business associations.

Secondly, there is a definite protection given to consumers by reason of the narrowing of the field in which speculation in food can occur.

Thirdly, there is an undoubted saving to the community generally resulting from the skill and economy with which the marketing functions are carried out, resulting in orderly distribution, quality control and reduction in price fluctuation. Marketing, after all, involves more than just selling and getting a price. That is the aspect often headlined, but there are many important and essential activities between the farm gate and the consumer. Goods have to be transported, assembled, graded, stored, processed and packed.

Furthermore, many Boards perform other functions such as those relating to crop insurance, crop finance, and price equalisation which gives producers equitable returns on various markets, and participation in stabilisation schemes.

But there is another side of the picture and we must now have a look at it. It was during the period of the seller's market after the war that marketing Boards came under their fiercest fire and this is a long way from having died down yet. The situation presented a very real danger to the whole structure. It was undoubtedly contentious. The consumer found himself at an economic disadvantage and there was a good deal of natural resentment because of shortages and high prices. Under such circumstances the responsibilities and obligations that Boards have to the community at large are highlighted to a very vivid illumination indeed. Wisdom, restraint and farseeing judgment in making decisions and administering policy were shown to be anything but academic ideas. Rather were they essential to the well-being of the organised marketing system itself. And may I add, they still are!

The whole situation was made even more complex by other factors that were less amenable to control. There were the higher prices in New South Wales which were attracting Queensland produce to that State—a situation which led to the 1951 amendment.

Then again, Section 92 of the Constitution not only complicated the position but also clouded the issues involved. Section 92 of the Australian Constitution provides that trade and commerce among the States shall be absolutely free and this continues to be a basic obstacle to the application of the principle of compulsion to marketing. Because of it some Boards are likely to become really little more than voluntary co-operatives.

This was the case with the potato and onion Boards, which are two of the casualties of the period we are dealing with. These organisations came up against the traditional difficulties of co-operatives formed for the sole purpose of selling a commodity—that is, that in the market place it is extremely difficult to obtain the support of all growers. It does not take much of a commodity sold outside a marketing scheme to upset that scheme very drastically. At best the onion and potato Boards were but voluntary co-operatives denied the protection of compulsory provisions regarding delivery because of the particular nature of the trade in these commodities. So they foundered on that very jagged rock which confronts the co-operative movement at every turn —grower loyalty. And may I associate with that grower understanding? For it is true that many growers had not the faintest idea of the real issues involved beyond the very obvious argument of their immediate self interest and their short-term financial benefit.

Similarly, the public are apt to be confused regarding a Board's functions, particularly as it relates to supply. Up to the time a farmer produces a commodity a marketing Board has no control whatever. It cannot regulate seasons any more than it can regulate farmers. It cannot prevent an under-supply any more than it can prevent an over-supply. Famines and gluts come and go irrespective of whether there is a Board or not. All that a Board can do is handle the situation that arises as best it can in the interests of all concerned. One may legitimately say, I think, that on balance because of the security it gives and the orderliness it can achieve a Board is more likely to smooth out the effects of fluctuations than to accentuate them.

I have mentioned the potato and onion marketing Boards which went out of existence during this period. There is another—the arrowroot Board—which was wound up because it no longer served any useful purpose. The arrowroot industry has declined because of labour costs and farmers turned their attention to more profitable lines. Just in passing I might mention that the arrowroot Board, which was constituted by Order in Council dated 1st December, 1922, was the first marketing Board set up under the Primary Products Pools Act of 1922 which followed the Wheat Pools Act.

And now, what of the future? Are we not like weary travellers who have come a long way and now find that we have a long way to go? After an arduous climb we have scaled the mountain peak and before us stands another, more imposing and even more difficult than the last. The future pattern of our markets?—That is the question to which the answer cannot be given in any clear cut terms. And why should we

expect it to be otherwise? It never has been. Amongst farmers to-day there is a great feeling of uncertainty. And this is not derived solely from the marketing situation but is due also to the knowledge that their cost structure is not as sound as it should be. Farming to-day as never before is a business and many of the decisions a farmer is called upon to make are purely and simply business decisions—particularly relating to how he will allocate his resources to get the best economic use he can from them.

In this connection it is interesting to note that some recent figures published by the Food and Agriculture Organisation of the United Nations show that the ratio of prices received and prices paid by farmers is in many countries tending downwards to the disadvantage of the farmer. In the U.S.A., for instance, the ratio in 1951 was 111 where it is now 95. In Canada it has fallen from 106 to 83. Only in Japan of the countries quoted in the article has there been any substantial rise in this ratio.

In plain English, the seller's market is at an end and costs are catching up with the farmer.

In all this uncertainty the very existence of organisation is one valuable form of insurance. Every one of the multitudinous ways in which Boards make their impact on the farmer's business creates an opportunity for improvement. And provided they get away from a too narrow concept of their job and approach their formidable tasks with a broad communal outlook there is no reason why they should not meet whatever is to come in the future with the same skill and success as in the past.

FRUIT AND VEGETABLE PRICES.

During the past twelve months or so the Division of Marketing has issued a number of supplements to the monthly Production Trends Report which describe the movements in wholesale prices of some fruit and vegetable crops at the Brisbane Markets from 1st January, 1948. These analyses are set out in considerable detail and although one or two of them have been published in the Journal there is not sufficient space for the whole series.

The crops dealt with include pineapples, apples, oranges, bananas, papaws, tomatoes, beans, peas, pumpkins and lucerne. They have been issued in roneoed form and any one or all of them will be made available to interested growers on request.

Queensland Fauna Conservation Legislation.

"The Fauna Conservation Act of 1952."

By C. ROFF, Fauna Officer.

(*Continued from page 326 of the June Issue.*)

PEST FAUNA.

Pest fauna includes species which are serious pests of the agricultural and pastoral industries. These can be destroyed throughout the State at any time of the year subject to restrictions relating to sanctuaries and some specified districts as listed below.

List of Pest Fauna.

BIRDS.

Wedge tailed eagle.
Grey (white) goshawk.
Australian goshawk.
Collared sparrow-hawk.
Cormorants (shags).
Eastern swamphen (bald coot).
Falcons except the nankeen kestrel.
White cockatoo.
Silvereyes.
Crows and ravens.
Pied currawong.
Grey butcher bird.
Sparrow.
Starling.
Turtle dove.
Rose-breasted cockatoo (galah).
Bee eaters (Pest fauna only within the Brisbane and East Moreton Pest Destruction Board areas).

MAMMALS.

Dingoes.
Rabbits.
Foxes.
Hares.
Flying foxes (Pest fauna only within the Brisbane and East Moreton and Toowoomba Pest Destruction Board areas).

PERMANENTLY PROTECTED FAUNA.

The koala (Plate 2), platypus and echidna are permanently protected on account of their unique place in Australian and world fauna. Power to extend the list of permanently protected fauna is provided.

Permanent protection means that animals so declared are protected in perpetuity and accordingly penalties in this part of the Act are higher than those provided for in other sections.

Plate 2.

Koalas (Phascolarctos cinereus Goldfuss). Permanently protected fauna in Queensland.

PROTECTED FAUNA.

Although special provision is made for permanently protected fauna and pest fauna, all other fauna are deemed to be protected fauna, that is, fauna for which a close season exists throughout the whole year. It should be noted that for certain protected fauna an open season may be declared from time to time. It is an offence to take protected fauna.

Special permission may be granted for the taking of protected fauna that are causing serious damage or injury to any property, including crops or livestock, or are otherwise causing serious personal loss to the owner or occupier of any holding or are causing or likely to cause an injury to any person.

Special provision is made also for the taking of protected fauna likely to cause trouble on an aerodrome.

In all special permits issued, the general conditions under which fauna may be taken are specified; and the disposal of the fauna is subject to provisions that may be imposed.

OPEN SEASONS.

For commercial and sporting purposes the fauna outlined in the following table have fixed open seasons and any person in possession of an "open season fauna permit" may hunt or trap them during the periods indicated. An "open season fauna permit" is not required, however, to take wild duck or quail during an open season.

List of Open Seasons.

BIRDS.

Common Name.	Open Season.	District(s).
Black-throated finch Chestnut-breasted finch (bull finch) Diamond firetail (diamond sparrow) Banded finch (double-bar finch) Longtailed finch (grass finch) Masked finch Plum-headed finch Red-browed finch (redhead finch) Star finch (redfaced finch) Zebra finch	1st July to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
All introduced birds including— Java sparrow Non-pareil finch Nutmeg finch Strawberry finch Goldfinch	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Budgerigah or shell parrot King parrot Rainbow lorikeet (Blue Mountain parrot) Red winged parrot	1st May to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Rosellas (all species)	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Cockatiel (cockatoo parrot or quarrian)	1st May to 30th November in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Brush or scrub turkey	1st June to 30th September in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6
Grey duck (black duck) Maned goose (wood duck) Quail (all species) (NOTE.—In districts 1, 2, 3, an open season for wild duck and quail is declared from time to time by Order in Council)	1st January to 31st December in each year inclusive	Nos. 4, 5, and 6
Australian snipe Pin-tailed snipe Knot Great knot Sandpiper Stint Tattler Whimbrel	14th November in each year to 15th March in the following year inclusive	Nos. 1, 2, 3, 4, 5, and 6

MAMMALS.

Common Name.	Open Season.	District(s).
Grey kangaroo Red kangaroo Eastern or dusky wallaroo North Queensland wallaroo Red-necked, scrub or eastern brush wallaby Black-striped wallaby Whiptail, grey-face or pretty face wallaby Black-tailed or swamp wallaby Sandy wallaby Red-legged pademelon Water rat	1st January to 31st December in each year inclusive	Nos. 1, 2, 3, 4, 5, and 6

During open seasons "bag" limits may be imposed and the following table outlines the maximum number of fauna which any one person may have in possession during an open season, within the period specified.

Number.	Name of Fauna.	Period.
15	Wild duck	24 hours
15	Quail	24 hours
2	Scrub turkey	24 hours

The following fees are payable for permits:—

	£	s.	d.
Open season fauna permit (for personal use) ..	0	10	0
Open season fauna permit (taken for sale) ..	1	0	0

Unless specifically indicated, an open season fauna permit does not authorise entry by the permit holder onto any land the property of another. Additionally, although an open season may be declared, fauna may not be taken in a sanctuary.

SANCTUARIES.

Protection from molestation does not alone ensure the survival of some birds and animals. Hence the legislation makes provision for the creation of sanctuaries (that is, areas in which all birds and animals except declared pests are totally protected and free from interference at all times).

All islands that form part of the State of Queensland, all National Parks, State Forest Reserves, and many other areas and private properties have been declared sanctuaries. Sanctuary notices may be displayed and the unauthorised removal of these notices is an offence.

Landholders and their authorised agents are permitted to take without restriction pest fauna within a sanctuary.

Persons may be ordered by authorised officers to leave a sanctuary and it is an offence not to quit a sanctuary when so ordered.

PROHIBITED APPLIANCES FOR THE TAKING OF FAUNA.

The use of cyanide and adhesive substances such as bird-lime is prohibited, and other poisons, materials and appliances may also be prohibited from time to time.

The use of flashlights or torches or other artificial light of any description is illegal, as also is the use of certain "prohibited guns" defined in the Act.

Dogs may be used only to take fauna during an open season.

Plate 3.

Dynevor Lakes, a Waterfowl Sanctuary in South-western Queensland.

KEEPING FAUNA AND THE TAKING OF FAUNA FOR PARTICULAR PURPOSES.

For certain purposes, principally scientific and educational, the taking and keeping of fauna may be permitted. The conditions, provisions and restrictions under which a permit is granted are indicated on the permit. It is illegal to keep fauna in captivity unless authorised by the Act. It is not an offence, however, to keep open season fauna or fauna lawfully held prior to the inception of this Act.

Construction and Maintenance of Enclosures, Cages and Aviaries.

Enclosures, cages and aviaries where fauna are confined whether privately, for public exhibition purposes, or for sale, must be kept clean and in a sanitary condition. Further, all captive fauna must be regularly fed and watered.

Aviaries.

All aviaries containing twenty or more birds must be registered annually, and no fauna shall be sold or otherwise disposed of from premises, including enclosures, cages and aviaries, unless disposal is approved and until any necessary royalty due is paid.

FAUNA AND SKIN DEALERS AND MOVEMENT AND SALE OF FAUNA.

Fauna and Skin Dealers.

A person engaged in fauna or skin dealing is required to take out a license and all premises must be registered. A permit, license or certificate to deal in fauna or skins does not authorise the holder of such to take fauna. Permanently protected fauna cannot be handled by fauna or skin dealers.

License fees payable by fauna and skin dealers are as follows:—

	£	s.	d.
Fauna dealer	2	0	0
Skin dealer	10	0	0

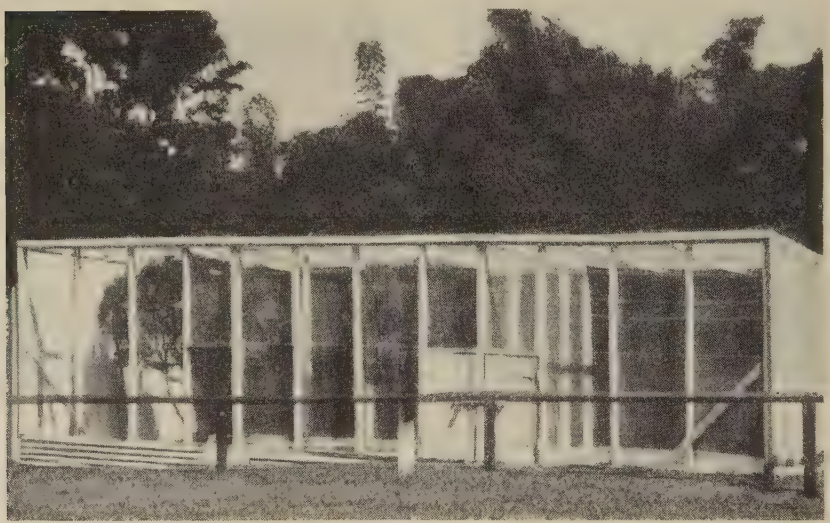

Plate 4.

Authorised Aviary at Queen's Park, Ipswich.

Movement of Fauna.

Fauna may be removed only by permit within Queensland. It is also provided that fauna shall not be exported to another State unless an export permit has been obtained and an import permit granted by the proper authority in the place outside Queensland to which the fauna are being introduced.

All crates, bags or bales containing skins must be branded with identifying marks.

The introduction of fauna not found naturally in this State is subject to special permission. This clause guards against the introduction and liberation of noxious fauna.

Sale of Fauna.

The sale of permanently protected fauna is prohibited although the sale of protected fauna (including open season fauna) legally taken and held may be permitted.

ROYALTY.

Royalty at the prescribed rates outlined below is chargeable on all fauna taken in Queensland.

Birds.

A. For all native and migratory birds the royalty shall be payable at the rate of 5s. for each bird except (*a*) the birds specified in list 1 and open season fauna specified in list 2 wherein the royalty rates are indicated respectively and (*b*) pest fauna, for which there shall be no royalty.

Plate 5.

Australian Bustard or Plain Turkey (Eupodotis australis Gray). A protected bird in Queensland. (Photo by courtesy of the Director of the Queensland Museum).

List 1.

	£	*s.*	*d.*
Black cockatoo (all species)	5	0	0
Black swan	5	0	0
Bower bird (all species)	2	0	0
Brolga or native companion	1	0	0
Burdekin duck	3	0	0
Bustard or plain turkey	5	0	0
Cassowary	10	0	0
Finches except finches for which an open season exists	1	0	0
Green pigmy goose	5	0	0
Ground parrot	5	0	0
Ibis (all species)	5	0	0
Jabiru	10	0	0
Jacana or lotus bird	2	10	0
Lyrebird	10	0	0
Magpie goose or pied goose	1	0	0
Major Mitchell cockatoo or pink cockatoo	2	0	0
Manucode or rifle bird (all species)	10	0	0
Palm cockatoo	5	0	0
Pelican	5	0	0
Sea eagle (white-breasted)	3	0	0
Sea eagle (red-backed)	3	0	0

List 2.

	s.	*d.*
Black-throated finch	0	6
Chestnut-breasted finch	0	1
Diamond firetail	0	3
Banded finch	0	1
Longtailed finch	0	6
Masked finch	0	6
Plum-headed finch	0	1
Red-browed finch	0	1
Star finch	1	0
Zebra finch	0	1
All introduced aviary birds except—		Nil.
Java sparrow	0	3
Non-pareil finch	0	3
Nun finch	0	3
Nutmeg finch	0	3
Strawberry finch	0	3
Goldfinch	0	3
Budgerigah or shell parrot	0	3
King parrot	1	0
Rainbow lorikeet (Blue Mountain parrot)	2	0
Red winged parrot	2	0
Rosellas	0	3
Cockatiel (cockatoo parrot or quarrian)	0	3
Brush or scrub turkey Wild duck and quail Snipe Sandpiper Stint Tattler Whimbrel Knot	No royalty payable during open season. General rate of 5s. per bird to be paid when taken under special permit during close season.	

Mammals.

B. For all mammals the royalty shall be payable at the rate of 5s. for each mammal except (*a*) the mammals specified in list 1 and open season fauna specified in list 2 wherein the royalty rates are indicated respectively and (*b*) pest fauna for which there shall be no royalty.

List 1.

	£	*s.*	*d.*
Koala	50	0	0
Platypus	20	0	0
Echidna	15	0	0

List 2.

For all mammals listed in the first column of the table in this list the royalty charged shall be at the rate of 5 per centum of the gross selling price of such skins when sold in Queensland provided that if there is no gross selling price upon which to assess the royalty then the royalty charged shall be at the rate listed in column 2 of the table in this list.

Open Season Fauna.

Column 1.	Column 2. s. d.
Grey kangaroo	0 6
Red kangaroo	0 6
Eastern or dusky wallaroo	0 3
North Queensland wallaroo	0 3
Red-necked scrub, or eastern brush, wallaby	0 3
Black-striped wallaby	0 3
Whiptail, greyface, or pretty face wallaby	0 6
Black-tailed or swamp wallaby	0 3
Sandy wallaby	0 3
Red-legged pademelon	0 3
Water-rat	0 1

The person who takes the fauna, the fauna dealer and the skin dealer are liable jointly or severally for the payment of royalty, provided that royalty shall not be paid more than once upon any fauna. Power is given for dealers to deduct royalty from monies held as a result of the sale of fauna. It is an offence not to pay royalty and provision is made for the recovery of unpaid royalty. Fauna, including skins, may be seized if royalty is unpaid.

GENERAL.

It is obligatory for holders of authorities issued under the Act to abide by any conditions contained therein and such authorities must be carried when engaging in the business allowed in the permit.

For humane reasons all traps must be inspected at intervals of not more than 36 hours.

A person in possession of fauna can be required to supply proof that the particular fauna was taken or is kept lawfully under the Act.

The forging of permits and similar actions which may be used to circumvent the true purposes of the Act constitute offences for which a heavy penalty is provided.

Fauna, weapons or other things seized may be detained for a period of twelve months unless it is established at an earlier date that no offence has been committed. Upon conviction for an offence all weapons or fauna seized are automatically forfeited to the Crown.

Unless expressly provided, right of entry to land is not granted by the issuance of any permit. The owner or occupier of land may demand the name and address of any person trespassing upon a holding and may require the trespasser to quit the holding. It is an offence to remain on the holding if ordered to leave.

VOL. III. OF THE "QUEENSLAND AGRICULTURAL AND PASTORAL HANDBOOK."

"INSECT PESTS AND DISEASES OF PLANTS."

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Special Price to Queensland Producers—10s.—Post Free (Others £1, Post Free).

INOCULATION OF LEGUME SEEDS.

★ ★

The Department of Agriculture and Stock supplies cultures of bacteria for the inoculation of seeds of legumes such as Poona pea, blue lupins, lucerne and clovers.

Seed inoculation is often necessary where the legume intended for planting has not previously been grown successfully, as it provides the plants with bacteria which are necessary for their full development.

Cultures are supplied free and post free. They are in bottles and have to be mixed with skim milk for sprinkling on the seed.

Order from the Under Secretary, Department of Agriculture and Stock, Brisbane, at least 10 days before sowing. State amount and type of seed to be treated.

The Honey Flora of South-eastern Queensland.

By S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 278 of the May issue.*)

Western Tea-Tree.

Botanical Name.—*Melaleuca decora* Salisb.

Other Common Names.—Black tea-tree, tea-tree.

Other Botanical Name.—*Melaleuca genistifolia* Sm.

Distinguishing Features.—A shrub or small tree with whitish papery bark, small narrow pointed but not prickly leaves densely arranged but not in pairs, and dense white fluffy flower-spikes (Plates 121-124).

Plate 121.

Western Tea-tree (Melaleuca decora). Typical clump on Darling Downs. Mt. Emlyn, via Millmerran.

Plate 122.

Western Tea-Tree (Melaleuca decora). Leaves, buds and flowers. Inset shows leaves and seed-capsules.

Description.—This is a shrub or small tree sometimes up to 30 ft. high but mostly less, with whitish papery bark and a dense dull green crown. The leaves are very numerous but not in pairs, without stalks, $\frac{1}{4}$-$\frac{3}{8}$ in. long, about $\frac{1}{8}$ in. wide, tapering to a sharp point, with the veins scarcely visible, and giving forth a definite scent when crushed. The flowers are small but densely packed in white fluffy spikes at the ends of the branchlets, about $\frac{3}{4}$-$1\frac{1}{2}$ in. long and about $\frac{5}{8}$-$\frac{3}{4}$ in. wide; there are five small sepals, five slightly larger white petals, five bundles of white stamens and a central style. The branch grows out beyond the flowers. The seed-capsules are cup-shaped, about $\frac{1}{8}$ in. long and wide.

Distribution.—Widely distributed in forest country in south-eastern Queensland, chiefly on swampy, low-lying, ill-drained or sandy soil, and in eastern New South Wales.

Usual Flowering Time.—December-January.

Colour of Honey.—Light amber.

Importance as Source of Honey.—Medium.

Importance as Source of Pollen.—Major.

General Remarks.—On the Darling Downs this tree is often sought for nectar and pollen. In favourable seasons good quantities of honey are harvested although prolonged dry weather at flowering results in a small crop. In coastal districts the species is less important.

The honey has a strong harsh flavour, a somewhat displeasing aroma and reasonable density; it adversely affects any mild light honeys with which it may be blended; conversely, due to the light colour it improves dark strong honeys.

This honey, which is only third grade, granulates with a medium-sized white grain, and is used principally for manufacturing purposes.

Plate 123.

Western Tea-tree (Melaleuca decora). Portion of trunk.

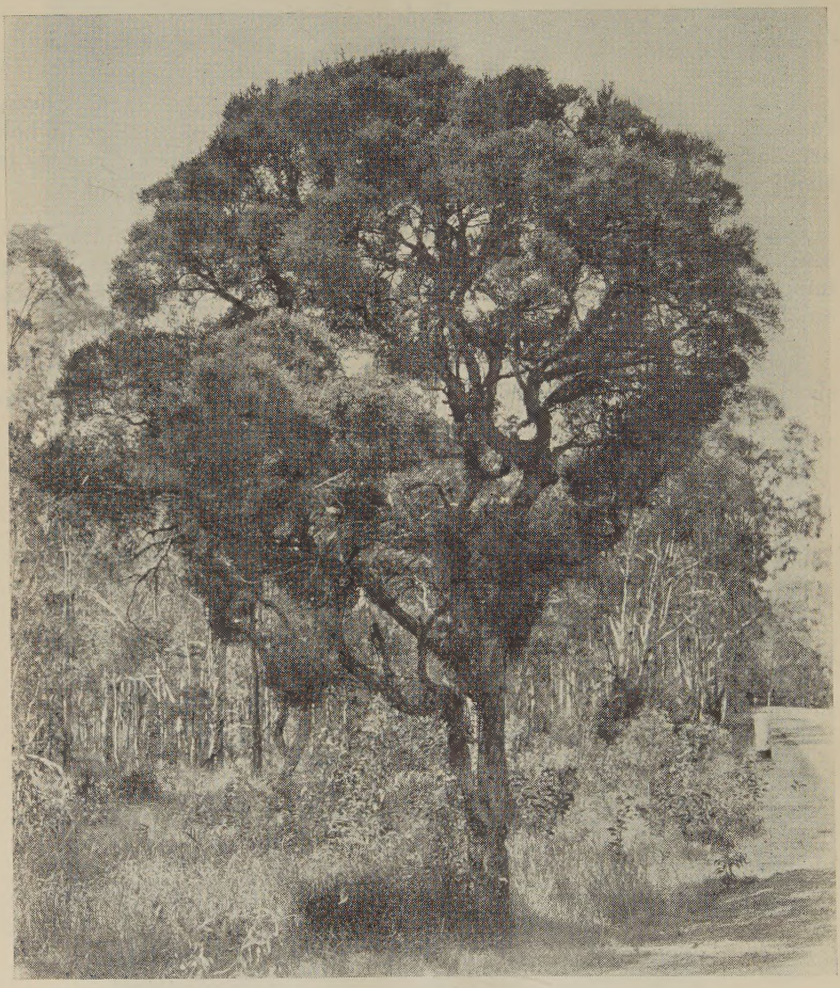

Plate 124.

Western Tea-tree (Melaleuca decora). Typical tree of coastal districts. Deception Bay.

Prickly-leaved Paperbark.

Botanical Name.—Melaleuca nodosa Sm.

Other Common name.—Tea-tree.

Distinguishing Features.—A shrub or small tree with whitish papery bark, small narrow stiff prickly-pointed leaves, and balls of creamy flowers resembling those of a wattle (Plates 125-126).

Plate 125.

Prickly-leaved Paperbark (Melaleuca nodosa). Leaves, buds and flowers.

Description.—This is a shrub or small tree rarely more than 20 ft. high and commonly much less, with whitish papery bark. The leaves are very numerous, but not in pairs, dirty dull green, stiff, very narrow, prickly-pointed, mostly $\frac{1}{2}$-1 in. long, usually not more than $\frac{1}{16}$ in. wide and sometimes quite needle-like. The flowers are cream coloured, very small, and crowded in rounded clusters about $\frac{1}{2}$-1 in. wide at the ends of the branches; each flower has five tiny sepals, five small thin petals, five bunches of stamens and a central style. The branch continues to grow after flowering so that the compact cluster of small seed-capsules surrounds the branch.

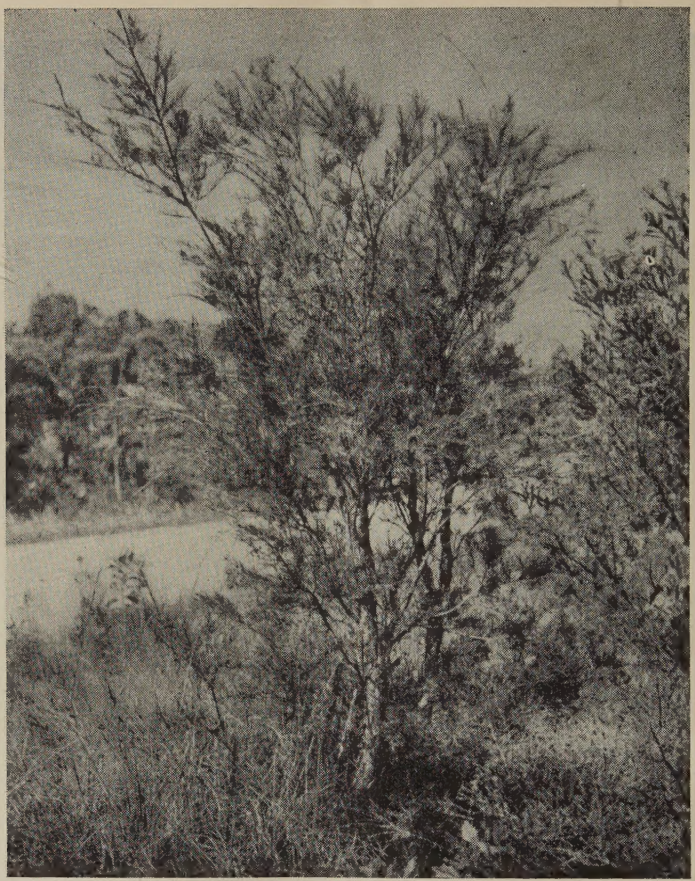

Plate 126.
Prickly-leaved Paperbark (Melaleuca nodosa). Gumdale.

Distribution.—This plant is widely spread in south-eastern Queensland, chiefly on sandy and somewhat swampy soil. It usually occurs as undergrowth in forest country. It is found also in the Maranoa, Leichhardt and south-eastern part of the Mitchell districts and in eastern New South Wales.

Usual Flowering Time.—September-October.

Colour of Honey.—Dark amber.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—The poor-quality honey and the pollen make excellent bee food which encourages brood-rearing.

This honey is not gathered by bees in extractable quantities.

[TO BE CONTINUED.]